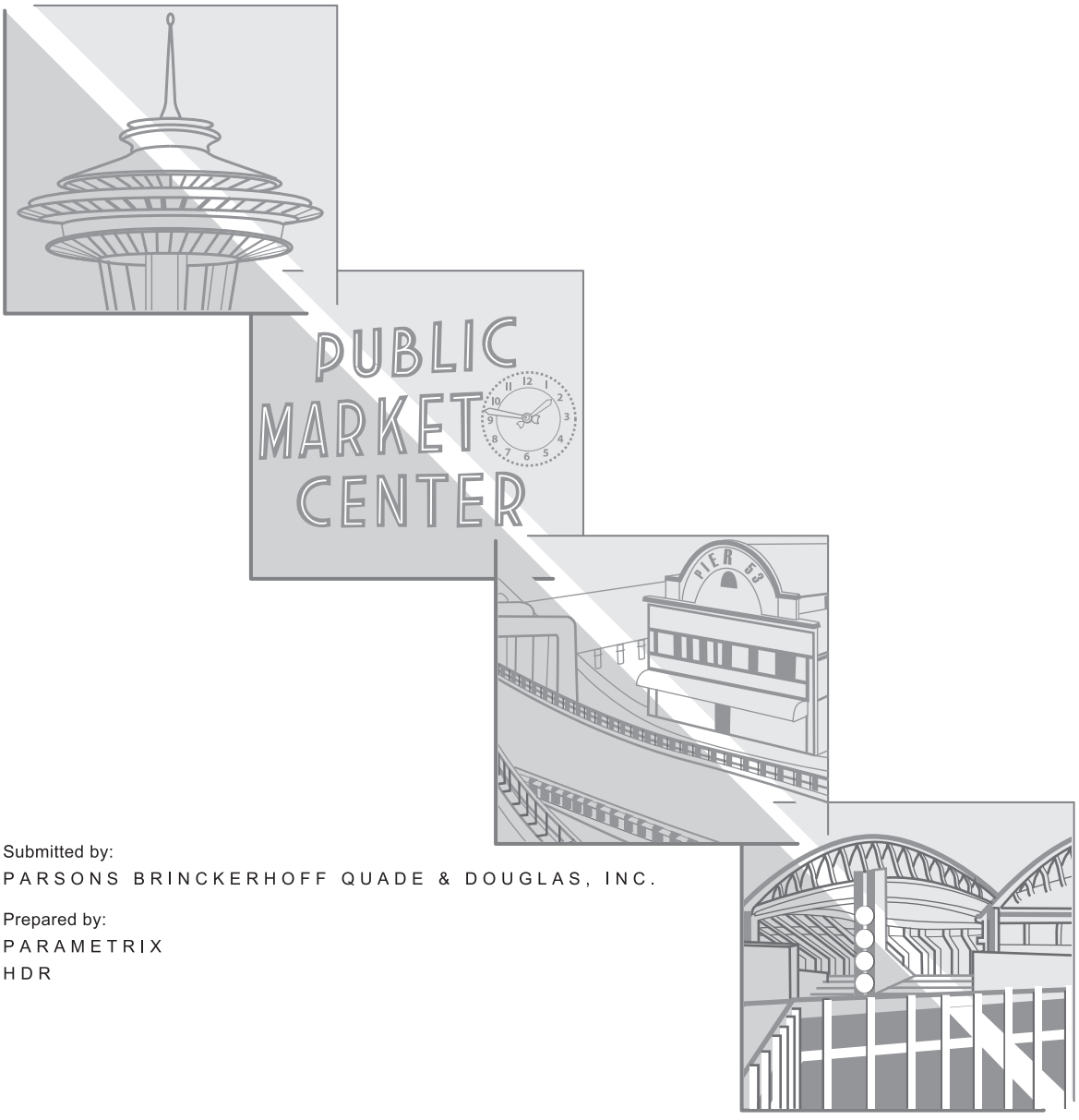
SR 99: ALASKAN WAY VIADUCT & SEAWALL REPLACEMENT PROJECT

Supplemental Draft Environmental Impact Statement

APPENDIX O

Public Services and Utilities Technical Memorandum



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U.S. Department of Transportation
Federal Highway Administration

Washington State
Department of Transportation

City of
Seattle

SR 99: ALASKAN WAY VIADUCT & SEAWALL REPLACEMENT PROJECT

Supplemental Draft EIS
Public Services and Utilities Technical Memorandum

AGREEMENT NO. Y-7888

FHWA-WA-EIS-04-01-DS

Submitted to:

Washington State Department of Transportation
Alaskan Way Viaduct and Seawall Replacement Project Office
999 Third Avenue, Suite 2424
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The SR 99: Alaskan Way Viaduct & Seawall Replacement Project is a joint effort between the Washington State Department of Transportation (WSDOT), the City of Seattle, and the Federal Highway Administration (FHWA). To conduct this project, WSDOT contracted with:

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Taylor Associates, Inc.
Tom Warne and Associates, LLC
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LIST OF EXHIBITS

ACRONYMS

AWV	Alaskan Way Viaduct
BMP	best management practice
BNSF	Burlington Northern Santa Fe Railway Company
EIS	Environmental Impact Statement
EMF	electric and magnetic field
FHWA	Federal Highway Administration
HP	high-pressure
IP	intermediate-pressure
kV	kilovolt
OH	overhead
SCL	Seattle City Light
SIG	Seattle International Gateway
SODO	South of Downtown
SR	State Route
UD	underdrain
UG	underground
WSDOT	Washington State Department of Transportation

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PREFACE

The technical appendices present the detailed analyses of existing conditions and predicted effects of each alternative. The results of these analyses are summarized and presented in the main text of the Supplemental Draft Environmental Impact Statement (EIS).

The Supplemental Draft EIS appendices are intended to add new information and updated analyses to those provided in the Draft EIS, published in March 2004. Information that has not changed since then is not repeated in these appendices. Therefore, to get a complete understanding of the project area conditions and projected effects, you may wish to refer to the appendices that were published with the Draft EIS. These are included on a CD in the Supplemental Draft EIS. To make it easier to understand where there is new information or analyses, the supplemental appendices present information in the same order as it was presented in the Draft EIS appendices.

The Supplemental Draft EIS and the technical appendices evaluate the effects of three construction plans: the shorter plan, the intermediate plan, and the longer plan. These plans vary in how long SR 99 would be completely closed, in how long the periodic closures may be, and in the total construction duration. For the purposes of the analyses in the technical appendices, two construction plans are evaluated with the Tunnel Alternative and one plan is evaluated with the Elevated Structure Alternative. However, each alternative could be built with any of the three plans. The construction durations and the sequencing would not be the same for a particular construction plan if paired with a different alternative; however, the effects would be within the ranges presented by the analyses.

There are several differences in how the information is presented between the main text of the Supplemental Draft EIS and how it is presented in these appendices. The Supplemental Draft EIS text refers to possible variations within the alternatives as "choices" while these appendices use the term "options." (For example, Reconfigured Whatcom Railyard versus Relocated Whatcom Railyard is referred to as a design choice in the Supplemental Draft EIS and as an option in the appendices.) In either case, the intent is to describe the various configurations that could be selected and the effects for each design.

One design choice in particular is handled very differently between the Supplemental Draft EIS text and the technical appendices. For the Tunnel Alternative in the central waterfront area, there is a choice between a stacked tunnel alignment and a side-by-side tunnel alignment. In the appendices, to simplify the discussion, these two alignments, as well as the Elevated

Structure Alternative, are each paired with a different set of options throughout the corridor and presented as complete sets that are evaluated separately. The Supplemental Draft EIS text communicates this information differently by describing one Tunnel Alternative and one Elevated Structure Alternative and evaluating the effects of the different design choices (or mix-and-match components) separately. While it may appear that there are three alternatives analyzed in the appendices and two in the Supplemental Draft EIS text, there are in fact only two alternatives. Each alternative has many potential components or design choices that can be made throughout the corridor.

The organization of the analysis of the alternatives is also a little different between the main body of the Supplemental Draft EIS and the appendices. In the Supplemental Draft EIS text, we identify two alternatives: a Tunnel Alternative and an Elevated Structure Alternative. The Supplemental Draft EIS text compares these alternatives directly by comparing effects (for example, the effects of both alternatives on water quality are presented together). The appendices present the effects of each alternative separately (for example, all of the effects of the Tunnel Alternative are presented first, followed by all of the effects of the Elevated Structure Alternative). The substance of both discussions is the same. The organization of the Supplemental Draft EIS technical appendices mirrors that of the Draft EIS appendices, allowing you to more easily find comparable information in the Draft EIS appendices.

Chapter 1 SUMMARY

1.1 Introduction

This technical memorandum describes the updated alternatives for the Alaskan Way Viaduct (AWV) and Seawall Replacement Project and supplements the 2004 Draft Environmental Impact Statement (EIS) Appendix O, Public Services and Utilities Technical Memorandum, for impacts and mitigation. A full discussion of impacts and mitigation for all five Build Alternatives and the No Build Alternative was presented in the Draft EIS (WSDOT et al. 2004), which can be referenced for original text, tables, and exhibits relating to public services and utilities.

In December 2004, the project proponents selected the Tunnel Alternative and the Rebuild Alternative to be carried forward. The Tunnel Alternative was selected as the Preferred Alternative. Since that time, engineering and design has been refined and updated for the Tunnel and Rebuild Alternatives. Due to the magnitude of changes in the design of the Rebuild Alternative, it has been renamed the Elevated Structure Alternative. The Elevated Structure Alternative combines elements of the Aerial and Rebuild Alternatives that were evaluated in the Draft EIS. This document evaluates effects on public services and utilities from the proposed construction and operation of the updated Tunnel Alternative and the Elevated Structure Alternative.

Notable updates from the 2004 Draft EIS Appendix O include the following:

- Only the updated Tunnel (Preferred) and Elevated Structure Alternatives are being considered (along with the No Build Alternative). The other alternatives were dropped from consideration after issuance of the Draft EIS.
- The updated Tunnel and Elevated Structure Alternatives differ slightly in their alignments and options when compared to those presented in the Draft EIS. Some options previously being considered are no longer included in the updated alternatives, and new options have been developed. Section 1.2.2 provides a summary of the alternatives and options.
- The updated project alternatives include an extension of the northern limit of the project. The north area of the project now extends to about Comstock Street, about 0.8 mile north of the Battery Street Tunnel.

Collectively, there are many other changes in the updated Tunnel and Elevated Structure Alternatives; however, these changes do not considerably affect the public services and utilities related impacts. Therefore, the impacts and mitigation measures presented in the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum, are very similar to the impacts of and mitigation for the updated Tunnel and Elevated Structure Alternatives, with the addition of what is included in this supplemental memorandum.

This memorandum describes changes to the affected environment for public services and utilities along the AWV Corridor. Where new information or new project features are presented, the potential construction and operation impacts and their mitigation measures are discussed. The topics presented in this report include methodology, studies and coordination, affected environment, operational impacts and benefits, construction impacts, secondary and cumulative impacts, and mitigation measures. In general, public services and utilities within three to five blocks of existing or proposed facilities are identified as being within the study area of potential construction or operational impacts. However, there is a general understanding that there are potential operational impacts to public services and utilities beyond the immediate study area, and these effects have been disclosed.

1.2 AWV Study Area Sections

For discussion purposes, the project area has been broken into the following sections:

- South – S. Spokane Street to S. Dearborn Street
- Central – S. Dearborn Street to the Battery Street Tunnel
- North Waterfront – Pine Street to Broad Street
- North – Battery Street Tunnel to Comstock Street
- Seawall – S. Washington Street to Broad Street

1.3 Alternatives and Options

General overviews for the Tunnel and Elevated Structure Alternatives are provided below. See the 2006 Supplemental Draft EIS Appendix B, Alternatives Description and Construction Methods Technical Memorandum, for additional information. The No Build Alternative and the affected environment described in the Draft EIS have not changed and continue to be a basis for the environmental analysis. Please refer to the No Build scenarios described in the Draft EIS and the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum.

Each alternative has many potential components or choices that can be made throughout the corridor which are referred to as "options" in this report. The options are project features that are intended to provide some choices that can be mixed and matched with the proposed Build Alternatives. Exhibit 1-1 shows the options that have been evaluated with the Tunnel and Elevated Structure Alternatives. For ease of presentation and analysis, each alternative is described with a specific set of options in this report.

Exhibit 1-1. Tunnel and Elevated Structure Alternatives with Options

Options[1]	Tunnel Alternative	Elevated Structure Alternative
South Section		
Reconfigured Whatcom Railyard	yes	yes
Relocated Whatcom Railyard	yes	yes
Central Section		
Steinbrueck Park Lid	yes	no
Steinbrueck Park Walkway	yes	no
SR 99 Over Elliott and Western Avenues	yes	yes
SR 99 Under Elliott and Western Avenues	yes	no
North Section		
Battery Street Tunnel Curves Widened	yes	no[2]
Battery Street Tunnel Curves Not Widened	yes	yes
Partially Lowered Aurora	yes	yes
Lowered Aurora	yes	no[2]

[1] These mix-and-match features are referred to as "choices" in the Supplemental Draft EIS text.

[2] These options could be included with the Elevated Structure Alternative; however, they were not evaluated with this alternative in the technical appendices. See the Preface (page *v*) for an explanation of differences in the combinations of alternatives and mix-and-match features (choices or options) evaluated in the Supplemental Draft EIS and the technical appendices.

Design revisions have resulted in the updated alignments for alternatives; however, collectively, these revisions do not result in substantive changes to the impacts related to public services and utilities. The exception would be the new construction plans: the shorter plan, intermediate plan, and longer plan, where the effects to public services and utilities would be more comprehensive than identified in the Draft EIS due in part to their duration. Refer to Chapter 4 (Public Services) and Chapter 5 (Utilities) for discussions of impacts and benefits.

1.3.1 Tunnel Alternative (Preferred Alternative)

The Tunnel Alternative includes a combination of aerial structures, cut-and-cover tunnels, transition sections, and at-grade roadways to replace the existing viaduct. The components that make up this alternative and its options are summarized below by project section.

South – S. Spokane Street to S. Dearborn Street

SR 99 would be a side-by-side at-grade roadway with elevated South of Downtown (SODO) Ramps at S. Atlantic Street and S. Royal Brougham Way. The Whatcom Railyard would be reconfigured with SR 99 bridging over the rail tracks near S. Massachusetts Street.

Option: Relocated Whatcom Railyard

This option would move the at-grade SR 99 roadway to the west of its existing location, adjacent to E. Marginal Way S. where the Whatcom Railyard is now located. The Whatcom Railyard would be shifted to the east to occupy the existing highway right-of-way next to the Burlington Northern Santa Fe Railway Company (BNSF) Seattle International Gateway (SIG) Railyard, avoiding the need for a bridge over the rail track connector.

Central – S. Dearborn Street to the Battery Street Tunnel

The viaduct would be replaced with a stacked (double-level) tunnel with three northbound lanes (below) and three southbound lanes (above) from approximately S. Dearborn Street to Pine Street. From Pine to Virginia Streets, SR 99 would transition from the tunnel to an aerial structure, crossing over the BNSF rail tracks. The aerial structure would be built under Elliott and Western Avenues with the Steinbrueck Park Walkway connecting Steinbrueck Park at the north end of the Pike Place Market to the waterfront below. The side-by-side aerial structure would connect to the Battery Street Tunnel.

There would be no ramps at Pike Street as there were with the Tunnel Alternative described in the Draft EIS. Instead, ramps at Elliott and Western Avenues would provide Ballard/Interbay freight connections.

On the west side of the Alaskan Way surface street, a 70-foot-wide area would include a sidewalk, a public activity zone, and a waterfront promenade. A 20-foot-wide sidewalk would run along the east side of the surface street. Bicyclists would travel in dedicated 5-foot-wide lanes, separated from vehicular traffic by striping.

Option: Side-by-Side Tunnel Alignment

Under this option, the viaduct would be replaced with a six-lane, side-by-side tunnel from approximately S. Dearborn Street to Pine Street. From Pine Street to the Battery Street Tunnel, the existing aerial structure and the Elliott and Western Avenue ramps would be replaced with new structures.

Option: Over Elliott and Western Avenues

The aerial structure between Pine and Virginia Streets would pass over Elliott and Western Avenues and then connect to the Battery Street Tunnel.

Option: Steinbrueck Park Lid

A portion of the SR 99 aerial structure that connects from Pine Street to the Battery Street Tunnel would have a full lid built over the top of the roadway, providing open space and a pedestrian connection from the north end of Steinbrueck Park to the central waterfront below.

North Waterfront – Pine Street to Broad Street

The Alaskan Way surface street would be rebuilt with two lanes each way. Two waterfront streetcar tracks would be installed in the center, with alternating turn pockets in the center lane and streetcar stops between Pine and Broad Streets.

No options are proposed in this area.

North – Battery Street Tunnel to Comstock Street

Battery Street Tunnel Improvements

The vertical clearance in the tunnel would be increased to 16.5 feet. The curves on the south and north ends would not be substantially modified. Fire/life safety improvements, which include seismic upgrades and access and egress improvements, would be added, as described in the Draft EIS.

Partially Lowered Aurora

Aurora Avenue N. would be lowered in a retained cut from the north portal of the Battery Street Tunnel to Republican Street, with roadway improvements and widening up to Aloha Street. Thomas and Harrison Streets would bridge over Aurora Avenue N. Mercer Street would continue to pass beneath Aurora Avenue N. and would be widened to three lanes in each direction with a center left-turn lane.

Option: Battery Street Tunnel Improvements with Widened Curves

The Battery Street Tunnel would be improved as described above, except the curves at both the south and north portals would be widened.

Option: Lowered Aurora

North of the Battery Street Tunnel, Aurora Avenue N. would be widened extending from the Battery Street Tunnel north to Comstock Street. Aurora Avenue N. would be lowered below grade with retaining walls on either side, allowing Thomas, Harrison, Republican, and Roy Streets to pass at grade over Aurora Avenue N. Mercer Street would also be widened more than was considered in the Draft EIS and would cross over Aurora Avenue N. on a new bridge.

Seawall – S. Washington Street to Broad Street

The seawall would be replaced with the outer wall of the tunnel from S. King Street to Union Street. From the vicinity of Union Street to Broad Street, an independent seawall would be rebuilt.

No options are proposed in this area.

The various options for the Tunnel Alternative can be mixed and matched within the alternative. However, for purposes of evaluating project effects, the Supplemental Draft EIS and this technical memorandum evaluate two possible alignments consisting of these mix-and-match options. The two alignments are referred to as the stacked tunnel alignment (which is the preferred alignment) and the optional side-by-side tunnel alignment. The components of each tunnel alignment are shown below in Exhibit 1-2.

Exhibit 1-2. Options Included in the Tunnel Alignments

	South	Central	North
Preferred Stacked Tunnel Alignment	Reconfigured Whatcom Railyard	Stacked Tunnel Steinbrueck Park Walkway SR 99 Under Elliott and Western	Battery Street Tunnel Improvements Partially Lowered Aurora
Optional Side-by-Side Tunnel Alignment	Relocated Whatcom Railyard	Side-by-Side Tunnel Steinbrueck Park Lid SR 99 Over Elliott and Western	Battery Street Tunnel Improvements with Curves Widened Lowered Aurora

1.3.2 Elevated Structure Alternative

The Elevated Structure Alternative would replace the existing viaduct and seawall with the components described below.

South – S. Spokane Street to S. Dearborn Street

SR 99 would be an at-grade side-by-side roadway with elevated SODO Ramps at S. Atlantic Street and S. Royal Brougham Way. The Whatcom Railyard would be reconfigured with SR 99 bridging over the tracks.

Option: Relocated Whatcom Railyard

The Whatcom Railyard would be relocated rather than reconfigured, as described under the Tunnel Alternative.

Central – S. Dearborn Street to the Battery Street Tunnel

The viaduct would be rebuilt with a stacked (double-level) aerial structure; the existing ramps at Seneca and Columbia Streets and Elliott and Western Avenues would also be rebuilt. SR 99 would connect to the Battery Street Tunnel as an aerial structure over Elliott and Western Avenues, similar to the existing configuration. No lid or walkway structure would be provided to connect Steinbrueck Park to the waterfront. Sidewalks would be provided on each side of Alaskan Way, and 4- to 5-foot-wide bike lanes would be located on each side of the street as well.

No options are proposed in this area.

North Waterfront – Pine Street to Broad Street

The Alaskan Way surface street would be reconstructed with two lanes each way with left-turn pockets provided at key intersections. A single waterfront streetcar track would be rebuilt on the east side of Alaskan Way.

No options are proposed in this area.

North – Battery Street Tunnel to Comstock Street

The Battery Street Tunnel would be upgraded with fire/life safety improvements and the vertical clearance would be increased to 16.5 feet as described for the Tunnel Alternative. The Partially Lowered Aurora improvements would also be made as described for the Tunnel Alternative.

No options are proposed in this area.

Seawall – S. Washington Street to Broad Street

The seawall would be rebuilt from S. Washington Street to Broad Street.

No options are proposed in this area.

1.4 Construction Plans

The construction plan refers to the total duration of construction, as well as how long or how often SR 99 from S. Spokane Street to Denny Way would be closed to traffic in either or both directions. Three construction plans are being considered: the shorter plan, which would close the SR 99 corridor for approximately 42 months; the intermediate plan, which would close the corridor for approximately 18 to 27 months; and the longer plan, which would close the corridor for approximately 3 months.

The shorter plan would close SR 99 for a longer duration than other construction plans, but it would allow for a shorter overall construction period. The intermediate plan would close SR 99 to all traffic as required by construction phases, but would allow either southbound or northbound traffic whenever possible. The longer plan would keep SR 99 open as much as possible but would have the longest total construction duration.

1.4.1 Shorter Plan

The shorter plan would close SR 99 to traffic from S. Spokane Street to Denny Way for a minimum of 42 months (3.5 years). The majority of the construction activities would take place during the corridor closure. The duration of construction with the shorter plan would be approximately 7 years for either tunnel alignment. This duration includes construction activities that would not require SR 99 traffic disruptions, such as the initial utility relocations and early site work (approximately 30 months) that would be performed outside the corridor closure period and would occur for any construction plan.

1.4.2 Intermediate Plan

The intermediate plan would close SR 99 to traffic from S. Spokane Street to Denny Way for no less than 18 months and up to 27 months (or longer). In addition, the intermediate plan assumes periods of time when the northbound lanes would be closed and southbound lanes would be open, and vice versa. For either tunnel alignment, the overall construction duration for the intermediate plan would be 8 to 8.75 years.

1.4.3 Longer Plan

The Elevated Structure Alternative was analyzed with the longer plan, which is similar to the construction plan described in the Draft EIS. This plan would only close SR 99 for 3 months. SR 99 would remain open as much as possible but would experience detours along First Avenue S. in the south section and Broad Street in the north section. The longer plan would have the longest total construction duration, approximately 10 years.

The longer plan is based on the following assumptions:

- Two lanes in each direction would be maintained at all times except for a 3-month complete closure.
- The Broad Street Detour would be used for southbound traffic in the north.
- First Avenue S. would be used for southbound traffic in the south to facilitate the earlier construction of the east half of the SODO Ramps at S. Atlantic Street and S. Royal Brougham Way.
- On Alaskan Way, one lane would be maintained in each direction by moving temporary detour alignments along the corridor as needed to accommodate construction activities and to provide access to waterfront businesses.
- The Battery Street Tunnel might be reopened prior to an operational ventilation system.

1.5 Traffic Stages and Construction Duration

Each alternative, alignment, option, and construction plan would have a series of traffic stages that would cause significant changes to traffic flow and routes within the corridor, such as detours or closures. Each traffic stage encompasses certain construction activities that must be completed prior to moving into the next traffic stage and the subsequent construction activities.

The Draft EIS estimated that relocation of utilities in Traffic Stage 1 would take up to 18 months. In the Supplemental Draft EIS, based on additional engineering and utility agency coordination, relocation of utilities in Traffic Stage 1 would require up to 30 months. The affected area for utility construction in the AWV Corridor would generally include the AWV Corridor from S. Royal Brougham Way to the south portal of the Battery Street Tunnel. The construction area within the corridor would be occupied by multiple contractors performing temporary and permanent utility relocations. Refer to the 2006 Supplemental Draft EIS Appendix B, Alternatives Description and Construction Methods Technical Memorandum, for additional details.

Traffic Stage 1 encompasses the first move for utility relocations in the AWV Corridor. This approximately 30-month period for preliminary utility relocation is now included in project scheduling. Traffic Stage 1 is currently scheduled to begin in early 2008. However, the initial utility alignments and construction sequences are still conceptual and are subject to change. The initial utility move would also include relocations that would be required for Traffic Stages 2 and 3, and the construction activities of both permanent and temporary structures. Relocations of utilities would continue to be planned in close consultation with the utility purveyors and as part of preliminary and final engineering, although these activities are expected to take place in latter stages, such as Traffic Stage 5 or 6.

For a complete description of the Traffic Stages 1 through 6 proposed under the Tunnel and Elevated Structure Alternatives, refer to the 2006 Supplemental Draft EIS Appendix B, Alternatives Description and Construction Methods Technical Memorandum.

Chapter 2 METHODOLOGY

Please refer to the March 2004 Draft EIS and Chapter 2 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum, for methodology. There have been no substantive changes in the methodology used for this Supplemental Draft EIS technical memorandum.

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Chapter 3 STUDIES AND COORDINATION

Please refer to Chapter 3 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum, for studies and coordination. There have been no notable changes in the studies and coordination used for this Supplemental Draft EIS technical memorandum, with the following exceptions.

3.1 Coordination

Correspondence and research was conducted with the following agencies:

- Seattle Fire Department was consulted on potential property acquisition and response time impacts related to public services in the AWV Corridor.
- Seattle Police Department was consulted on response time impacts related to law enforcement services in the AWV Corridor.
- Seattle Public Schools Transportation Office was consulted regarding bus routes through the AWV Corridor.
- Seattle City Light (SCL), Seattle Department of Transportation, and Seattle Public Utilities were consulted relating to utilities.

3.2 Studies

Data was collected from the following sources, and these documents are incorporated by reference:

- Conceptual Design for Utilities for the Alaskan Way Viaduct and Seawall Replacement Project – Basic Configuration Drawings North of Battery Street Tunnel Concept 12C. Prepared by Parsons Brinckerhoff Quade & Douglas, Inc. and Rosewater Engineering for WSDOT. November 16, 2005.
- Conceptual Design for Utilities for the Alaskan Way Viaduct and Seawall Replacement Project – Rebuild Plan. Prepared by Parsons Brinckerhoff Quade & Douglas, Inc. and Rosewater Engineering for WSDOT. June 30, 2005.
- Conceptual Design for Utilities for the Alaskan Way Viaduct and Seawall Replacement Project – Tunnel Plan. Prepared by Parsons Brinckerhoff Quade & Douglas, Inc. and Rosewater Engineering for WSDOT. June 30, 2005.
- City of Seattle. 2004. Seattle Comprehensive Plan, Attachment 12: Capital Facilities Appendix A. Reference resource for public services and utilities.

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Chapter 4 PUBLIC SERVICES

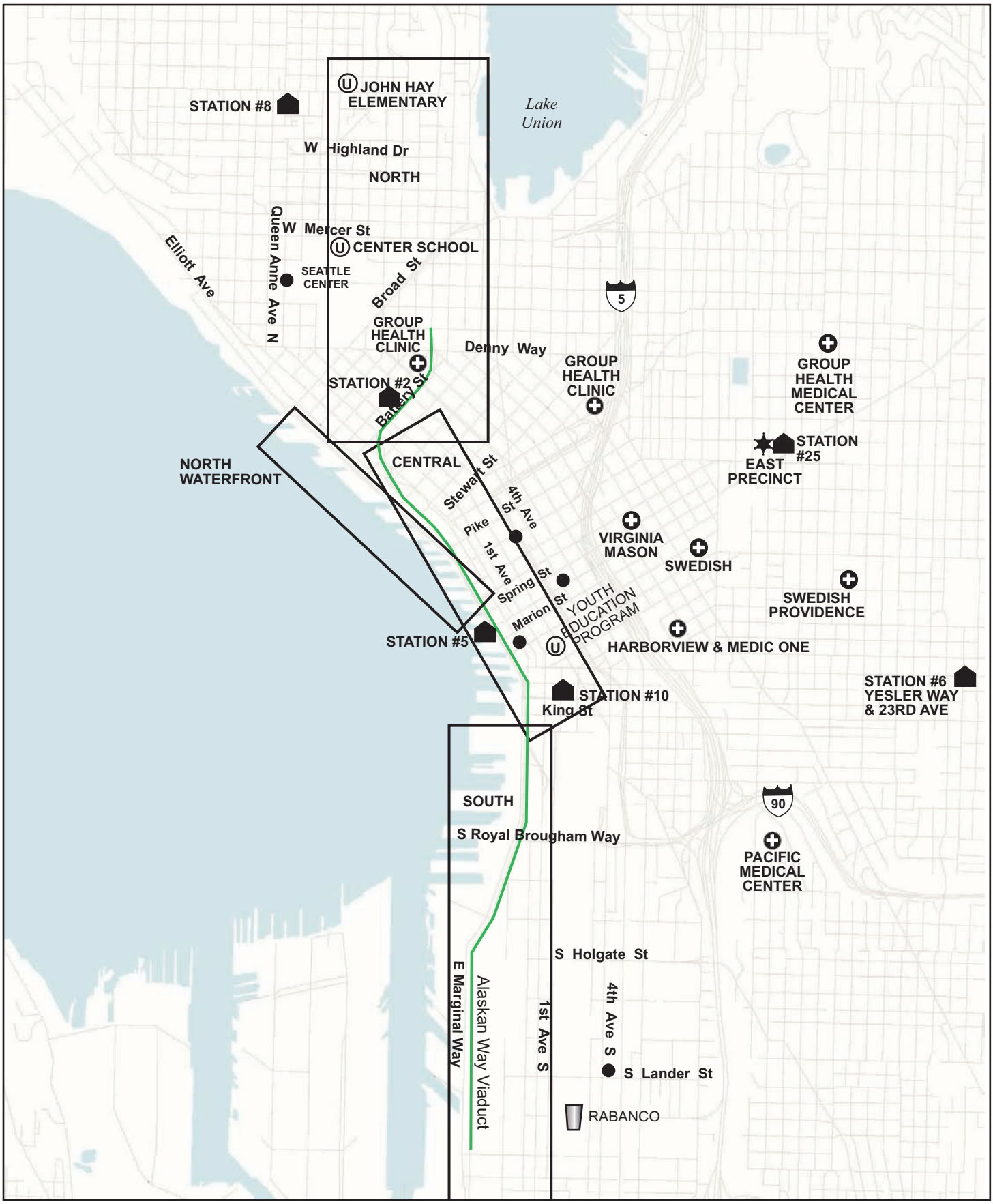
4.1 Affected Environment

This chapter includes descriptions of the services affected by the Tunnel (Preferred) and Elevated Structure Alternatives, followed by potential impacts and mitigation. Other community services are discussed in the 2006 Supplemental Draft EIS Appendix I, Social Resources Technical Memorandum. Please refer to Section 4.1 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum, for a complete description of the affected environment, including the following public services: fire suppression/emergency medical services; law enforcement services; postal services; disaster preparedness; public schools; and solid waste collection, disposal, and recycling.

Design revisions since the Draft EIS have resulted in the updated Tunnel and Elevated Structure Alternatives analyzed in the Supplemental Draft EIS. However, these revisions have not resulted in notable changes to the affected environment for public services or utilities previously described in the 2004 Draft EIS Appendix O. There are minor exceptions related to fire suppression and public schools. Additionally, the project's study area has changed in the north and now extends three blocks farther north to about Comstock Street, about 0.8 mile north of the Battery Street Tunnel. Due to this three-block extension, two new public services are included in the study area and have been added to Exhibit 4-1. Exhibit 4-1 displays the locations of public services in the area. This three-block extension does not require a new assessment of the available public services.

4.1.1 Fire Suppression and Emergency Medical Services

Because the improvements north of the Battery Street Tunnel would require the project area to be extended north to include Comstock Street, the project area now includes fire and emergency response coverage from Seattle Fire Station No. 8, located at 110 Lee Street near Lower Queen Anne. This station includes one fire engine and one ladder truck. The statistics for this station include an 88 percent response time in 4 minutes for emergency medical services and a 95 percent response time in 4 minutes for fire suppression (City of Seattle 2004). Four minutes is the City's standard, as set forth in the 2004 Comprehensive Plan.



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SCALE IN FEET

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Boundary Line
Solid waste/Recycling
Postal Services

Fire Stations
Police
Hospitals
Schools

Exhibit 4-1
Public Services in the AWV Study Area

4.1.2 Public Schools and Transportation

The north section of the AWV project area is located within the Queen Anne/ Magnolia region of the Seattle Public School District. The school nearest to the north section of the AWV project area is John Hay Elementary (K-5) (City of Seattle 2004), which is within five blocks of Comstock Street (see Exhibit 4-1). According to the Facilities Department of the Seattle School District, enrollment in March 2006 for John Hay Elementary was 452 students.

4.2 Operational Impacts and Benefits to Public Services

The differences between the updated Tunnel and Elevated Structure Alternatives and the alternatives evaluated in the Draft EIS are described below by project section (south, central, north waterfront, north, and seawall).

4.2.1 Impacts Common to Both Build Alternatives

The common impacts to public services have changed minimally for the Supplemental Draft EIS, and the analysis prepared in the 2004 Draft EIS Appendix O describes these impacts. For a description of the common impacts to public services, such as fire and emergency medical service, law enforcement, school bus routes, solid waste collection and disposal, and disaster preparedness, refer to Section 4.2.2 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum.

4.2.2 Tunnel Alternative (Preferred Alternative)

This section describes the operational impacts of the Tunnel Alternative and its options by project section. For a complete description of the Tunnel Alternative, refer to Section 1.3.1.

South – S. Spokane Street to S. Dearborn Street

Reconfigured Whatcom Railyard

Both the stacked and the side-by-side tunnel alignments would be at-grade in the south section, with a new six-lane roadway (three lanes each way) from S. Walker Street to S. Dearborn Street. In general, the new roadway would be located in the existing SR 99 footprint. The at-grade SR 99 would begin to rise at S. Walker Street to a short aerial overpass that would carry SR 99 above the rail track at S. Massachusetts Street. The roadway would return to grade just north of S. Massachusetts Street and remain at-grade to just north of Railroad

Way S. It would then continue in a retained cut to the south portal near S. Dearborn Street.

The Tunnel Alternative would also include the new elevated SODO Ramps at S. Atlantic Street and S. Royal Brougham Way. The interchange would be very similar to the SR 519 elevated ramps described in the Draft EIS; the SODO Ramps would consist of elevated streets connecting S. Atlantic Street and S. Royal Brougham Way on the east and west sides of SR 99. These streets would pass over SR 99 on elevated structures in an east-west direction and would include sidewalks on the outside.

Ramp movements at this intersection would include the following:

- Northbound off-ramp from SR 99 to S. Atlantic Street with frontage road connections to S. Royal Brougham Way.
- Northbound off-ramp from SR 99 to Alaskan Way surface street at S. King Street.
- Northbound on-ramp to SR 99 from S. Royal Brougham Way with frontage road connections from S. Atlantic Street.
- Southbound on-ramp to SR 99 from Alaskan Way surface street near S. King Street.
- Southbound on-ramp to SR 99 from Alaskan Way surface street near S. Royal Brougham Way with frontage road connections to S. Atlantic Street.

In general, the operational impacts and benefits for the stacked and side-by-side tunnel alignments in the south section would be the same as those discussed in Section 4.2.4 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum, for the Tunnel Alternative and the Aerial Alternative. The exceptions are noted as follows.

The roadway and ramp design improvements have the potential to improve the operational capacity for access and through movements for vehicles in the south section of the corridor (versus the No Build condition). Enhanced accessibility and travel time would directly benefit emergency service providers in the south section, namely Fire Station No. 5, Fire Station No. 10, Seattle Police Department's West Precinct, and emergency medical response. Travel time could also improve for other public services, such as solid waste/recycling collection and disposal, postal services, and school buses traveling on the connecting arterials in this section.

Option: Relocated Whatcom Railyard

No additional operational impacts are anticipated to public services with the Relocated Whatcom Railyard Option. This option might affect BNSF's ability to concurrently sort cars in the Whatcom Railyard and the BNSF SIG Railyard since both railyards would share a single tail track (Jacobs Civil, Inc. 2005).

Central – S. Dearborn Street to Battery Street Tunnel

Stacked Tunnel Alignment (Preferred)

This alignment would transition from a side-by-side to a stacked configuration between Railroad Way S. and S. Main Street, returning to a side-by-side configuration between Seneca Street and Union Street as it continues north, and then transitions to four lanes as it enters the Battery Street Tunnel.

Emergency access to surface streets would be provided on both the east and west sides of the tunnel near Pine Street (near the Seattle Aquarium) in the north and Seneca Street in the south.

Ramps

Although no midtown ramps would be provided for either of the tunnel alignments, access would be provided by a new northbound off-ramp and southbound on-ramp to and from Alaskan Way near S. King Street. Emergency vehicle access would be provided at Bell Street and at Western Avenue using the existing ramps, which would be closed to general traffic. The inclusion of emergency access at this location would provide a slight long-term benefit for response times to emergency service providers, namely Fire Stations No. 5 and No. 10.

Alaskan Way Surface Street

With the stacked tunnel alignment, the Alaskan Way Viaduct would be removed, and the surface street would be relocated east of the existing roadway. North of Yesler Way, two lanes in each direction would be provided, with turn pockets at intersections. Given the capacity constraints of the AWV Corridor, the surface street alignment was initially viewed in the Draft EIS to have potential access and mobility problems, which could cause increased response times for emergency services. However, under the stacked tunnel alignment, the surface street would be rebuilt to provide added capacity and turn pockets that would improve local access. These improvements would slightly benefit response times for emergency services (e.g., Fire Stations No. 5 and No. 10) in the central section of the AWV Corridor.

Ferry Access and Holding

With both the Tunnel and Elevated Structure Alternatives, the remote holding area for Colman Dock would be located east of SR 99. Ferry traffic access to Colman Dock would use Yesler Way, with ferry egress provided on both Yesler Way and Marion Street. Of key intersections reevaluated for the Supplemental Draft EIS, only the Marion Street/Alaskan Way intersection, which accommodates traffic exiting Colman Dock, would be congested under the Tunnel Alternative during ferry unloading. The remainder of the time, this intersection would not be considered congested.

The Tunnel Alternative would increase traffic volumes at this location, as much of the traffic destined through downtown would pass through it. However, more capacity would be provided under the Tunnel Alternative, thus traffic operations are expected to be similar to the 2030 Existing Facility scenario (No Build Alternative). As a result, the operational effects on public services, such as response time delays to emergency service providers (law enforcement, fire), are expected to be minor.

Option: Side-by-Side Tunnel and Over Elliott and Western

This option would continue north with three lanes in each of the two side-by-side tunnel sections. The tunnel would be approximately 122 feet wide and 60 feet deep. The aerial structure would transition to four lanes as it enters the Battery Street Tunnel. For the Over Elliott and Western Avenues Option, the underground tunnel would transition to an aerial structure (similar to the existing configuration), which would cross over these roadway sections.

Collectively, the operational impacts for the side-by-side tunnel alignment in the central section would be the same as those discussed in Section 4.2.4 of the 2004 Draft EIS Appendix O.

One difference between the Draft EIS and the current side-by-side tunnel alignment is that in the Draft EIS, the Tunnel Alternative proposed ramps to and from Alaskan Way north of Pike Street as replacement for the existing Elliott and Western ramps. As described above under the stacked tunnel alignment, ramp access would not be provided directly to the central business district. Emergency vehicle access would be provided at Bell Street and Western Avenue using the existing ramps, which would be closed to general-purpose traffic, and general access would be provided by a new northbound off-ramp and southbound off-ramp to and from the Alaskan Way surface street near S. King Street. Traffic destined for downtown would use an expanded Alaskan Way to distribute traffic to the downtown streets from the new King Street ramps.

Resulting traffic volumes on arterials along First Avenue, in particular Spring and Madison Streets, could pose additional response difficulties for Fire Stations No. 5 and No. 10, as well as police (Seattle Police Department's West Precinct and East Precinct) and emergency vehicles. Travel time delays could also be experienced by other public services, such as solid waste/recycling collection and disposal, postal services, and school buses traveling on connecting arterials. These effects would be somewhat diminished by the fact that Alaskan Way would be expanded to better distribute traffic into the downtown street grid system, reducing travel time and delay.

According to the Seattle Fire Department, fire suppression systems require a continuous water supply or a fire watch. Additionally, the alarm systems require either a continuous power supply or a fire watch. However, a fire watch is only allowable for very brief periods of time, i.e., a few hours. The fire watch could be used during the time to disconnect and reconnect a water supply system, but it cannot be used in place of a continuous water supply (English 2006 personal communication). These factors need to be considered as part of preliminary and final design.

North Waterfront – Pine Street to Broad Street

Alaskan Way Surface Street

The Draft EIS included proposed ramps at Pike Street; the updated Tunnel Alternative would not include these ramp improvements. However, once the Alaskan Way surface street capacity is increased with two lanes each way, it is anticipated that congestion would be reduced in this section, despite the lack of ramp improvements.

It should be noted that surface street improvements under the current Tunnel Alternative would extend north to Broad Street. These would include 4-foot-wide bike lanes along both sides of Alaskan Way surface street (rather than a single 13.5-foot-wide bicycle/pedestrian path on the east side of the roadway). In addition, a double set of waterfront streetcar tracks, as opposed to a single set, would extend from S. Main Street north to Clay Street.

The net effect on public services, such as fire suppression, emergency medical aid, law enforcement, postal service, school bus routes, and solid waste collection and disposal, would be minor.

Ferry Access and Holding

The effects to public services would be similar to the description provided above for the south section.

North – Battery Street Tunnel to Comstock Street

Battery Street Tunnel Improvements and Partially Lowered Aurora

For the Battery Street Tunnel improvements, the vertical clearance in the tunnel would be increased to 16.5 feet. The curves on the south and north ends would not be substantially modified. Fire/life safety improvements would be added as described in the Draft EIS.

In the Partially Lowered Aurora Option, Aurora Avenue N. would be lowered in a retained cut between the north portal of the Battery Street Tunnel and about Republican Street. Road improvements would continue to Aloha Street. The street grid would be reconnected over the top of the lowered Aurora by building two new bridges at Thomas and Harrison Streets. Mercer Street would continue to cross under Aurora Avenue N. It would be widened to seven lanes and reconfigured for two-way traffic (three lanes each way with a center turn lane).

Broad Street would be closed and backfilled to grade from approximately Fifth Avenue N. to Ninth Avenue N., allowing the street grade to be reconnected over the top. Operational impacts related to access restrictions, travel time delays, response times, fire/life safety, and increased demand placed on public services operating in the corridor would be similar to those described in Section 4.2.4 for the Tunnel and Aerial Alternatives in the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum.

Option: Battery Street Tunnel Improvements with Lowered Aurora

For the optional side-by-side tunnel alignment, the Battery Street Tunnel would be upgraded with the fire/life safety improvements and design modifications to widen curves at the north and south tunnel portals of the Battery Street Tunnel. The planned fire/life safety upgrades to the Battery Street Tunnel may help to slightly reduce additional demand placed on public service providers (Fire Stations No. 8 and No. 2 and West Precinct Police Station) in this section.

The Lowered Aurora Option would extend from the Battery Street Tunnel north to Comstock Street. Starting at the widened north portal of the Battery Street Tunnel, SR 99 would be lowered in a retained cut north to Comstock Street. This option would include five local streets crossing over the top of Aurora Avenue N.: Thomas, Harrison, Republican, Mercer, and Roy Streets. Also included in the improvements north of Battery Street Tunnel would be new ramps to and from SR 99 at the following locations:

- Northbound off to Republican Street.
- Northbound on from Denny Way and Republican Street.

- Southbound off to Roy Street and Denny Way.
- Southbound on from Roy Street and Republican Street.

Additionally, local street improvements would occur at several locations:

- A new Harrison Street would be rebuilt across the Broad Street right-of-way.
- Mercer Street would be widened and rebuilt from about Fourth Avenue N. to Dexter Avenue N.
- Broad Street would be closed from Fifth Avenue N. to Ninth Avenue N.
- A new Sixth Avenue N. would be provided between Harrison and Roy Streets.

The proposed ramps and local road improvements in this section would help provide full access to the local street system, which was fragmented by construction of SR 99's limited access roadway. This would improve transportation system capacity and travel time through this section of the corridor (versus the 2030 Existing Facility Scenario [No Build Condition]) for Fire Stations No. 8 and No. 2, Seattle Police Department's West Precinct, and emergency medical aid. Travel time could also improve for other public services, such as solid waste/recycling services, postal services, and school bus routes.

Seawall – S. Washington Street to Broad Street

In terms of operations, no additional demand on law enforcement and emergency services is expected to result from this action. The typical operational impacts related to access restrictions, travel time delays, response times, fire/life safety, and increased demand placed on public services would be similar to those described in Section 4.2.2 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum.

4.2.3 Elevated Structure Alternative

The Elevated Structure Alternative is similar to the Aerial Alternative's configuration described in the Draft EIS. This section describes the proposed activities by project section. For a complete description of the Elevated Structure Alternative, refer to Section 1.3.2.

South – S. Spokane Street to S. Dearborn Street

Reconfigured Whatcom Railyard

In the south section, as in the Tunnel Alternative, SR 99 would begin as an at-grade roadway with a Reconfigured Whatcom Railyard. The elevated

SODO Ramps at S. Royal Brougham Way and S. Atlantic Street would connect SR 99 and SR 519. The Elevated Structure Alternative would then transition to a stacked aerial structure near Railroad Way S., continuing to the Battery Street Tunnel, with three lanes in each direction and wider lanes and shoulders than the existing viaduct.

Refer to the Tunnel Alternative in Section 4.2.4 for a discussion of operational impacts to public services as they relate to the at-grade roadway with a Reconfigured Whatcom Railyard. For operational impacts on public services related to the elevated SODO Ramps and the stacked aerial structure (near Railroad Way S. to Battery Street Tunnel), refer to the Aerial Alternative described in Section 4.2.4 of the March 2004 Draft EIS and the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum. Collectively, the operational effects on public services would likely include access restrictions, travel time delays, response time delays, fire/life safety concerns, and the slight potential for increased demand. The provision to add northbound and southbound frontage roads on the east and west sides of SR 99 would support local access connections for general-purpose traffic and freight movements. These frontage roads would also help maintain emergency access and mobility connections to and from Terminal 46 and the south section of the AWV Corridor.

Option: Relocated Whatcom Railyard

This is the only option being considered for the Elevated Structure Alternative. No additional operational impacts to public services are anticipated with the Relocated Whatcom Railyard Option. This option might affect BNSF's ability to concurrently sort cars in the Whatcom Railyard and the BNSF SIG Railyard since both railyards would share a single tail track (Jacobs Civil, Inc. 2005).

Central – S. Dearborn Street to Battery Street Tunnel

The Elevated Structure Alternative is similar to the Aerial Alternative described in the Draft EIS. Operational impacts would be related to access restrictions, travel time delays, response times, fire/life safety, and increased demand placed on public services in the corridor. These impacts would be similar to those discussed for the Aerial Alternative in Section 4.2.4 of the 2004 Appendix O.

The existing viaduct would be replaced with a single-level aerial structure that would transition to a double-level (stacked aerial) configuration between S. King Street and near S. Main Street. The new double-level structure would be about 20 feet wider than the existing viaduct.

Rebuild Ramps at Columbia and Seneca Streets

The existing southbound Columbia Street on-ramp and Seneca Street off-ramp would be rebuilt in their present location. The existing alignment and lane widths would remain the same at 27 feet.

Alaskan Way Surface Street

The Elevated Structure Alternative's Alaskan Way surface street would be rebuilt in the same location as the existing roadway. Except for the section between S. Railroad Way and Yesler Way in the south section, which would carry three lanes each way, Alaskan Way would primarily be a four-lane roadway with two lanes in each direction. Along the waterfront, turn pockets would be provided in the center of the roadway. The Elevated Structure Alternative would also provide 5-foot-wide bike lanes and on-street parking on each side.

Western Avenue and Elliott Avenue Ramps

The existing northbound Western Avenue off-ramp and southbound Elliott Avenue on-ramp would be retained and improved. In the new configuration, Elliott Avenue would be an add lane, and Western Avenue would be a drop lane. The existing Battery Street ramps would be used for emergency access only.

North Waterfront – Pine Street to Broad Street

The existing Alaskan Way surface street would be rebuilt in its existing footprint in the north waterfront section of this alternative. Additionally, a bicycle lane would be constructed on both sides of Alaskan Way surface street, and two sets of waterfront streetcar tracks would extend north to Broad Street. The net effect to public services, such as fire suppression, emergency medical aid, law enforcement, and other services, such as postal services, school bus routes, and solid waste collection and disposal, would be minor.

North – Battery Street Tunnel to Comstock Street

In the north section, the side-by-side aerial structure would cross over the BNSF railroad tracks and continue to the Battery Street Tunnel. This section would be a six-lane rebuild of the existing aerial structure with add and drop lanes transitioning to four lanes before entering the Battery Street Tunnel.

Battery Street Tunnel

The Battery Street Tunnel would receive seismic and fire/life safety upgrades. The vertical clearance would be increased to 16.5 feet throughout the tunnel, and the curves at both the north and south portals would not change.

Partially Lowered Aurora

The Partially Lowered Aurora improvements would be the same as those described above under the stacked tunnel alignment, and benefits and operational impacts would be correspondingly similar (see Section 4.2.2 for the Tunnel Alternative for this section of the corridor).

Seawall – S. Washington Street to Broad Street

The seawall would be rebuilt from S. Washington Street to Union Street. For the Elevated Structure Alternative, the existing seawall would be replaced with an L-wall structure and soil improvements. Soil improvements would be performed to replace and improve portions of the seawall in front of Piers 48 and 66. In terms of operations, no additional demand on law enforcement and emergency services is expected to result from this action. The typical operational impacts related to access restrictions, travel time delays, response times, fire/life safety, and increased demand placed on public services would be similar to those described in Section 4.2.2 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum.

4.2.4 Benefits

Operational benefits to public services primarily relate to improved response times associated with roadway access and mobility improvements on the viaduct and adjacent surface streets. Such improvements can reduce the amount of delay in public service providers' response.

Travel times on SR 99 for both the Tunnel and Elevated Structure Alternatives would be about the same, and both alternatives would be expected to perform as well as or slightly better than the existing facility. Based on current traffic data, the arterial analysis shows about the same conditions for the Tunnel and Elevated Structure Alternatives. Slightly higher congestion is predicted on the Alaskan Way surface street under the Tunnel Alternative, and the intersections around Colman Dock would be moderately congested. Conversely, the Elevated Structure Alternative would maintain some of the current congestion problems associated with the Seneca and Columbia Street off-ramps. Both alternatives would improve existing conditions.

North of the Battery Street Tunnel, the Lowered Aurora Option is anticipated to improve access and connectivity. Traffic data prepared to support the

Supplemental Draft EIS show good intersection performance and better distribution of traffic on the street grid system due to additional street crossings over SR 99.

4.3 Construction Impacts to Public Services

Since the March 2004 submittal of the Draft EIS, further analysis has been performed for the Tunnel and Elevated Structure Alternatives. Revised construction impacts for these two alternatives are included in the following sections. Fire/life safety improvements to the Battery Street Tunnel were analyzed in Section 4.2.3 of the March 2004 Draft EIS and the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum.

4.3.1 Tunnel Alternative (Preferred Alternative)

The construction impacts to public services have not substantially changed for the updated Tunnel Alternative from those discussed in the Draft EIS. The notable exception would be with the intermediate construction plan and the shorter construction plan, which may cause somewhat greater effects to public services than those identified in the Draft EIS due to longer closure durations. The effects to public services from the intermediate plan and shorter plan are described at the end of this section.

South – S. Spokane Street to S. Dearborn Street

In the Draft EIS, the Tunnel Alternative included the existing SR 99 alignment south of S. Atlantic Street. The updated Tunnel Alternative includes two options in this area:

- The Reconfigured Whatcom Railyard Option would retain the existing SR 99 alignment between the BNSF SIG Railyard on the east and the Whatcom Railyard to the west with a connection between the railyards. A short bridge would carry SR 99 over the new tail track.
- The Relocated Whatcom Railyard Option would shift SR 99 to the west into the site of the existing Whatcom Railyard and shift the railyard to the east to occupy the existing highway right-of-way next to the BNSF SIG Railyard, avoiding the need for the bridge.

The proposed SODO Ramps (S. Atlantic Street and S. Royal Brougham Way) are the same as those in the Elevated Structure Alternative (see Section 4.2.3) and similar to the SR 99 At-Grade with Elevated SR 519 Ramps Option presented in the Draft EIS for the Tunnel Alternative. South of S. Atlantic Street, SR 99 would continue as a six-lane at-grade highway to a tunnel portal just south of S. Dearborn Street.

Road closures or lane closures and detours from the SODO Ramps in this section would result in traffic congestion and delay on the primary roads affected by construction, and also on surrounding roads that form alternate routes around the construction. This could affect emergency vehicle access to and through this area, particularly for Fire Stations No. 10 and No. 14, which serve this area with both emergency medical aid and fire suppression services.

Increased travel time could be experienced by other public services, such as solid waste/recycling collection and disposal, postal services, and school bus routes. The shifted location of the south tunnel portal at S. Dearborn Street would add slightly to these effects.

Reconfiguration or relocation of the Whatcom Railyard would likely limit access during construction and contribute to lengthier travel times on roads in the immediate vicinity. This could affect emergency vehicle response times to this area, namely for Fire Stations No. 10 and No. 14, as well as the local law enforcement services.

Central – S. Dearborn Street to Battery Street Tunnel

Elements of the current design that would be different from potential impacts described in the Draft EIS analysis include the following:

- Ferry holding would be located on the east side of SR 99 (as opposed to Terminal 46 in the Draft EIS).
- The Colman Dock entrance would be l at Yesler Way. Northbound traffic to the ferry terminal would remain on Marion Street, while southbound-only traffic would use Yesler Way.
- In the Draft EIS, no seawall replacement was proposed in front of Pier 66; however, now soil improvements between Blanchard and Battery Streets are included as part of the seawall replacement plans for the Tunnel Alternative.

Construction to accommodate ferry holding on the east side of SR 99 and soil improvements in front of Pier 66 would lead to temporary access restrictions and lane and road closures or detours during construction, which could generate traffic congestion and delays. This could make it more difficult to maintain response time standards for emergency services in this section of the corridor, particularly for Fire Stations No. 5 and No. 10, the Seattle Police Department's West Precinct, emergency medical aid, and disaster preparedness services. Other public services, such as solid waste/recycling collection and disposal, postal services, and school buses could also experience increased travel time.

Access along the waterfront is required to meet the City of Seattle Fire Department's emergency response requirements. If access is restricted for long periods, a viable temporary road access would need to be available on a 24-hour basis, 7 days a week. If this access is not available, then a temporary railroad overpass with local access at Broad Street (or neighboring streets) could be considered as an option (English 2006 personal communication).

No permanent relocation of Fire Station No. 5 is currently anticipated. The land-based services, fire trucks, and emergency response operations may be relocated temporarily during construction. Temporary relocation of Fire Station No. 5's land-based services might increase response times. How this temporary relocation of Fire Station No. 5 is sequenced in the construction plan will need to take into account the fact that the land-based services and the water-based services should be relocated to the same location due to staffing requirements. In considering this issue, pier and dock requirements to accommodate the two fireboats will need to be studied and coordinated with the Seattle Fire Department.

As described in Section 4.2.4 of the 2004 Draft EIS Appendix O, tunnel construction could restrict emergency access to properties on the west side of the alignment, resulting in increased response times for law enforcement, fire, and emergency services. This effect, however, would be limited to some degree by providing emergency access to surface streets on both the east and west sides of the tunnel. Fire suppression services could be temporarily affected by water line and fire hydrant relocations. Additionally, if fire hydrants are removed or are temporarily rendered inoperative, temporary hydrants would be required. However, coordination of these services during preliminary and final design will be initiated to minimize temporary service disruptions.

North Waterfront – Pine Street to Broad Street

The Draft EIS proposed ramps at Pike Street, which would likely lead to lane and road closures at nearby intersections over the short term, and over the long term, possibly would help improve roadway congestion at some intersections. The updated Tunnel Alternative does not include these ramp improvements. As a result, short-term traffic disruption associated with ramp improvements would be removed.

It should be noted that surface street improvements under the current Tunnel Alternative would extend north to Broad Street, including 4-foot-wide bike lanes on both sides of the Alaskan Way surface street (rather than a single 13.5-foot-wide bicycle/pedestrian path on the east side of the roadway). In addition, a double set of waterfront streetcar tracks, as opposed to the single

set proposed in the Draft EIS, would extend from S. Main Street north to Clay Street.

The net effect to public services, such as fire suppression, emergency medical services, law enforcement, and other services, such as postal services, school bus routes, and solid waste collection and disposal, would be minor.

North – Battery Street Tunnel to Comstock Street

The Tunnel Alternative included in the Draft EIS included widening the Mercer Street underpass. The Aerial Alternative included in the Draft EIS also had an option to lower the grade of Aurora Avenue N. (SR 99) and connect surface streets over the top on new bridges. Improvements to Mercer Street and the Partially Lowered Aurora Option are also included in the updated Tunnel Alternative. For the north section, the construction impacts would be similar to those presented in Section 4.3.2 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum, for the Aerial Alternative.

Exceptions would include SR 99 access at the following locations:

- Northbound on-ramp from Denny Way.
- Southbound off-ramp to Denny Way.
- Northbound right-turn access off to Republican Street with turn lane provided.
- Northbound right-turn access on from Roy Street with acceleration lane provided.
- Northbound and southbound right-turn access off to Roy Street with turn lane provided.
- Southbound right-turn access on from Roy Street.

Additionally, local street improvements and revisions would occur at the following locations:

- Mercer Street would be widened and rebuilt from about Fourth Avenue N. to Dexter Avenue N.
- Broad Street would be closed from Fifth Avenue N. to Ninth Avenue N.
- Thomas Street would be rebuilt over Aurora Avenue N.
- Harrison Street would be rebuilt over Aurora Avenue N. and across Broad Street between Fifth and Sixth Avenues N.
- Taylor Avenue N. would be rebuilt across Broad Street to connect to Harrison Street.
- A new Sixth Avenue N. would be provided between Harrison and Roy Streets.

Construction of the ramps and road improvements would require road and lane closures during construction, resulting in restricted access to several areas in this section of the AWV Corridor during construction. This would likely contribute to travel delays and increased congestion. This could affect emergency vehicle access to and through this area, namely for Fire Stations No. 2 and No. 8, which provide both emergency medical aid and fire suppression services. Response times for police, fire, emergency medical aid, and disaster preparedness services to locations within and near the construction area would likely increase. If emergency responses are significantly affected, additional Seattle Fire Department units may be necessary in this area (English 2006 personal communication).

Road or lane closures might also have a slight impact on school buses and other public services (e.g., postal services, recycling, solid waste, etc.) by delaying travel time through the area.

Seawall – S. Washington Street to Broad Street

Seawall replacement and associated soil improvements would begin at S. Jackson Street and end at Broad Street. In the Draft EIS, the seawall replacement went all the way to Myrtle Edwards Park (near Bay Street). As in the Draft EIS, the tunnel wall would act as the seawall in the central waterfront. Soil improvements that do not include rebuilding the seawall would occur between S. Jackson and S. Washington Streets and in front of Pier 66.

Construction impacts would be similar to those discussed for the Rebuild Alternative in Section 4.3.2 of the 2004 Appendix O, with some exceptions:

- The seawall replacement would end at Broad Street, as opposed to Bay Street in the Draft EIS.
- Soil improvements would be performed at Pier 66 (from Blanchard Street to halfway between Battery and Bell Streets).

Soil improvements in front of Pier 66 would lead to access restrictions and lane and road closures during construction, which could generate traffic congestion and delays. This would increase response times for emergency services in this section of the corridor, namely for Fire Stations No. 5 and No. 10, the Seattle Police Department's West Precinct, and emergency medical aid. Increased travel time could also be experienced by other public services, such as solid waste/recycling collection and disposal, postal services, disaster preparedness services, and school buses.

Construction Plans

For either tunnel alignment, the net effect of SR 99 closures to public services would be an increase in traffic congestion and delays on primary and secondary roads affected by construction. Response times for police, fire, and emergency medical aid to locations within and near the construction area would likely increase. These impacts were generally identified in Sections 4.3.1 and 4.3.2 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum. However, with both the intermediate and the shorter construction plans, the magnitude of these minor- to moderate-intensity impacts would increase proportionately based on the longer closure periods.

Traffic Stages and Construction Duration

For traffic stages under the Tunnel Alternative, the effects on public services vary with the construction plan. For example, under the intermediate plan, there are six traffic stages for both the stacked and side-by-side tunnel alignments. These traffic stages could result in disruption to SR 99 traffic based on road closures. The effects of these actions are detailed below. For consistency, the discussion is divided between the effects of the shorter plan and the intermediate plan.

Shorter Plan

Stacked and Side-by-Side Tunnel Alignments

The full closure of the corridor for a minimum of 42 months (3.5 years) and the time that would be required for Traffic Stage 1 actions, coupled with the actions listed under Traffic Stage 2, would result in several lane, ramp, and/or road closures. As a result, the shorter plan would result in the longest period of full closure with the highest magnitude of impact. Traffic Stage 1, estimated to have a duration of 30 months, would include utility relocations, the start of the secant pile wall construction between Pier 48 and Colman Dock, and soil improvements along the west side of the SODO Ramps. Parking under the viaduct would be removed, and Alaskan Way would be reduced to one lane in each direction. Seawall construction from S. Jackson Street to Pike Street would be completed.

In total, there are three traffic stages with the shorter plan, and a summary of the impacts on public services for Traffic Stages 2 and 3 is provided below. For southbound SR 99 on the mainline, lane closures would occur at the Battery Street Tunnel and in the central and south sections under Traffic Stage 2. For SR 99 access southbound, the Elliott and Western downtown ramps would be closed and the First Avenue and SODO off-ramp would be

closed. The duration of Traffic Stage 2 is estimated to be 42 months. Traffic Stage 3 would be open for the SR 99 mainline and for SR 99 access for its 12-month estimated duration.

The net effect to public services would be increased traffic congestion and delay on the primary roads affected by construction and on surrounding roads around the construction area. This would have a direct impact on emergency vehicle access to and through the corridor. Response times for police, fire, and emergency medical aid to locations within and near the construction area would likely increase. The greatest potential closure-related impacts on public services in the central and south sections would result from Traffic Stages 1 and 2. As a result, the primary public service providers affected in these areas would be Seattle Fire Stations No. 2, No. 5, and No. 10 and the Seattle Police Department's West Precinct.

Intermediate Plan

Stacked Tunnel Alignment

For the SR 99 mainline, southbound traffic in Traffic Stages 3 and 4 would cause the greatest closure-related impacts to public services with closures to the Battery Street Tunnel, restricted lane access in the north section, and closures in the central and south sections of the corridor. Public services would be greatly affected during Traffic Stages 3 and 4 due to the closure of the Elliott and downtown on-ramps. During Traffic Stage 4 when the First Avenue/SODO on-ramp is closed and SR 99 is completely closed, public services would likely experience the most severe delays and congestion.

Northbound traffic on the SR 99 mainline would experience the greatest closure-related impacts to public services during Traffic Stages 4 and 5. During Traffic Stage 4 when SR 99 would be completely closed, public services would experience the most severe delays and congestion. During Traffic Stage 5, the Battery Street Tunnel and the south section would continue to be closed and no access would be available at the First Avenue/SODO on-ramp or the Western off-ramp.

During Traffic Stages 2 through 4, there would be no north-south traffic on the Alaskan Way surface street. East-west access across Alaskan Way to the piers and waterfront businesses would be provided.

The net effect to public services would be increased traffic congestion and delay on the primary and secondary roads affected by construction. This would have a direct impact on emergency vehicle access to and through the corridor. Response times for police, fire, and emergency medical aid to locations within and near the construction area would likely increase. Traffic

on the SR 99 mainline and on the surface streets in the central section of the AWV Corridor would experience increased congestion and delays in travel time. As a result, the primary public service providers affected in these areas would be Seattle Fire Stations No. 2, No. 5, and No. 10 and the Seattle Police Department's West Precinct.

Side-by-Side Tunnel Alignment

For the SR 99 mainline, southbound traffic in Traffic Stages 3 and 4 would cause the greatest closure-related impacts to public services with closures to the Battery Street Tunnel, restricted lane access in the north section, and closures in the central and south sections of the corridor. Public services would be greatly affected during Traffic Stages 3 and 4 due to the closure of the Elliott and downtown on-ramps and First Avenue/SODO off-ramp. During Traffic Stage 4 when SR 99 is completely closed, public services would likely experience the most severe delays and congestion.

Northbound traffic on the SR 99 mainline would experience the greatest closure-related impacts to public services during Traffic Stages 4 and 5. During Traffic Stage 4 when SR 99 would be completely closed, public services would experience the most severe delays and congestion. During Traffic Stage 5, the Battery Street Tunnel and the south section would continue to be closed and no access would be available at the First Avenue/SODO on-ramp and the downtown and Western off-ramps.

During Traffic Stages 2 through 4, there would be no north-south traffic on the Alaskan Way surface street. East-west access across Alaskan Way to the piers and waterfront businesses would be provided.

The net effect to public services would be similar to the description provided above for the stacked tunnel alignment. Both directions of traffic on the SR 99 mainline and on the surface streets in the central section would experience the greatest closure-related impacts in terms of congestion and travel delay. As a result, the primary public service providers affected in these areas would be Seattle Fire Stations No. 2, No. 5, and No. 10 and the Seattle Police Department's West Precinct.

4.3.2 Elevated Structure Alternative

The Elevated Structure Alternative includes a combination of retrofitting and rebuilding the viaduct and rebuilding the seawall. Revisions have been made to the configuration; however, collectively, these revisions would not result in substantive changes to the impacts to public services. The effects to public services from the longer plan are included at the end of this section.

South – S. Spokane Street to S. Dearborn Street

The same improvements described above for the updated Tunnel Alternative are proposed in this area. Refer to Section 4.3.1 for a discussion of construction impacts.

Central – S. Dearborn Street to Battery Street Tunnel

The construction impacts for the Elevated Structure Alternative would generally be the same as those discussed for the Aerial Alternative in Section 4.3.2 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum. For the Elevated Structure Alternative, proposed soil improvements have changed since the Draft EIS; however, these changes would not alter the impacts identified for the Aerial Alternative in Section 4.3.2 of the 2004 Draft EIS Appendix O. For potential impacts on public services related to the relocation of Fire Station No. 5, refer to the Tunnel Alternative description in Section 4.3.1.

North Waterfront – Pine Street to Broad Street

The existing Alaskan Way surface street would be reconstructed with two lanes each way and left turn pockets provided at key intersections. Long-term use of the roadway is expected to be very similar to the current use, and access is expected to be similar. Proposed changes in this section of the corridor resulting from the Elevated Structure Alternative are not anticipated to result in substantive changes to impacts on public services that were not previously discussed in the 2004 Draft EIS Appendix O.

North – Battery Street Tunnel to Comstock Street

For the north section, the Elevated Structure Alternative would result in construction impacts very similar to those presented in Section 4.3.2 of the 2004 Draft EIS Appendix O for the Aerial Alternative. Construction impacts on public services would also be similar to those described in Section 4.3.1 for the Tunnel Alternative. Unlike the Aerial Alternative described in the Draft EIS, the Elevated Structure Alternative is paired with the Partially Lowered Aurora improvements and would only extend north to Aloha Street. As a result, impacts would be correspondingly somewhat lower.

Seawall – S. Washington Street to Broad Street

Soil improvements would be made to replace or improve portions of the seawall in front of Piers 48 and 66. Construction impacts on public services would be similar to those discussed for the Rebuild Alternative in Section 4.3.2 of the 2004 Draft EIS Appendix O.

Construction Plan

As described in Section 4.3.1, the construction plan refers to the total construction duration as well as how long the corridor from S. Spokane Street to Denny Way would be closed to north-south SR 99 traffic during construction. For the Elevated Structure Alternative, only the longer plan was considered.

The longer plan is based on the following assumptions:

- Two lanes in each direction would be maintained at all times except for a 3-month complete closure.
- The Broad Street Detour would be used for southbound traffic in the north.
- First Avenue S. would be used for southbound traffic in the south to facilitate the earlier construction of the east half of the SODO Ramps.
- On Alaskan Way, one lane would be maintained in each direction by moving temporary detour alignments along the corridor as needed to accommodate construction activities and to provide access to waterfront businesses.
- The Battery Street Tunnel might be reopened prior to an operational ventilation system.

The duration of the complete closure for the longer plan (3 months) is considerably less than for the intermediate plan (27 months or 2.25 years) or the shorter plan (42 months or 3.5 years) with the Tunnel Alternative. As noted above, two lanes would be maintained in both directions at all times, except for a 3-month complete closure. The range of these impacts was generally described in the March 2004 Draft EIS and Sections 4.3.1 and 6.1 of the 2004 Draft EIS Appendix O.

Traffic Stages and Construction Duration

The Elevated Structure Alternative, analyzed with the longer plan, would include seven traffic stages, and the overall construction duration would be 10 years. As with the Tunnel Alternative, the construction activities relating to the construction of the temporary ferry holding area and the relocation of the Whatcom Railyard and tail track would likely generate lengthier response times and travel delays for emergency service providers in the corridor. These impacts would be caused by lane and/or road closures and detours, resulting in increased traffic congestion.

For the southbound SR 99 mainline, Traffic Stage 4 activities would cause the greatest potential closure-related impact on public services, with closures at

the Battery Street Tunnel, the central waterfront, and in the south section of the corridor. For southbound SR 99 access, Traffic Stages 4, 5, and 6 would cause the greatest potential impacts on public services with closures at the Elliott on-ramp, the downtown on-ramp, and for Traffic Stage 4, the First Avenue/SODO off-ramp.

For the northbound SR 99 mainline, Traffic Stage 4 would cause the greatest potential closure-related impacts on public services. Traffic Stage 4 would include closure of the Battery Street Tunnel, the central waterfront, and the south section. For northbound SR 99 access, Traffic Stages 4 and 5 would also cause the greatest impacts on public services with closures at the Western off-ramp, the downtown off-ramp, and at the First Avenue/SODO on-ramp.

The net effect to public services would be increased traffic congestion and delay on the primary and secondary roads affected by construction. This would have a direct impact on emergency vehicle access to and through the corridor. Response times for police, fire, and emergency medical aid to locations within and near the construction area would likely increase. For the northbound and southbound SR 99 mainline, construction in the Battery Street Tunnel, the central waterfront, and the south sections of the AWV Corridor would cause the greatest overall closure-related impacts. As a result, the primary public service providers affected in these areas would be Seattle Fire Stations No. 2, No. 5, and No. 10 and the Seattle Police Department's West Precinct. The range of these impacts was generally identified in Sections 4.3.1 and 4.3.2 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum. However, with the longer plan, the magnitude of these minor- to moderate-intensity impacts would increase proportionately based on the change in duration identified for the traffic stages.

4.4 Mitigation for Public Services

The principal construction and operational impacts to public services identified in Chapter 4 could be mitigated as described in Section 4.4.3 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum. An objective of construction planning, along with minimizing other construction effects, is to maintain emergency response capability.

Core strategies for managing traffic during construction have been identified for evaluation and testing, and a refined package will be highlighted in the project's Final EIS through the Construction Transportation Management Program. In short, 31 transportation management strategies are included in Chapter 7 of the Supplemental Draft EIS and in the 2006 Supplemental Draft

EIS Appendix C, Transportation Discipline Report, Section 6.4. These strategies are intended to accomplish the following broad goals:

- Maintain reliable transit service.
- Improve and expand transit service in affected corridors.
- Maintain or increase arterial capacity.
- Manage traffic effectively.
- Enhance traveler information.
- Effectively manage transportation demand.

Refer to Section 6.4 of the 2006 Appendix C for a complete description of the 31 transportation management strategies.

An additional mitigation goal includes maintaining the emergency response capability for the Seattle Fire Department during the construction activities.

Chapter 5 UTILITIES

5.1 Affected Environment

Please refer to Section 5.1 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum, for a complete description of the affected environment. The updated information for the Supplemental Draft EIS technical memorandum is based on the conceptual design for utilities prepared in support of the Supplemental Draft EIS (see Section 3.2). These conceptual design plans identify the locations of existing utilities and proposed utility relocations at key intersections in the AWV Corridor. It should be noted that utility placement on overhead poles may still need to be considered for temporary relocation of the transmission lines (landside or waterside) (Kirchner 2006 personal communication).

5.2 Operational Impacts and Benefits to Utilities

5.2.1 Impacts Common to Both Build Alternatives

Some of the potential operational risks associated with utilities and the Supplemental Draft EIS Build Alternatives include design elements that could affect capacity, disrupt service, and/or impair access and maintenance functions. These typical impacts were disclosed in Section 5.2.2 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum. The effects from the updated Tunnel and Elevated Structure Alternatives would be similar.

5.2.2 Tunnel Alternative (Preferred Alternative)

The Tunnel Alternative includes a combination of aerial structures, cut-and-cover tunnels, transition sections, and at-grade roadway sections to replace the existing viaduct. The updated Tunnel Alternative includes two configurations for the central section, a stacked tunnel alignment and a side-by-side tunnel alignment. With regard to the stacked tunnel, it should be noted that the 5-foot depth of cover for the tunnel shown in the conceptual plans for this configuration was not addressed in the March 2004 Draft EIS. As a result, the tunnel's depth of cover is continuing to be studied, and substantial deviations might be necessary to accommodate Seattle City Light's and Seattle Public Utilities' design guidelines, operational practices, and functionality, which include service standards. In the central section, the Tunnel Alternative includes

two options, one of which would cross over Elliott and Western Avenues, and the other of which would cross under.

Many of these features were considered in the Draft EIS, and although revisions in the alignment of the various structures have been made, they would not affect the typical operational impacts presented in Sections 5.2.2 and 5.2.4 of the 2004 Draft EIS Appendix O. Refer to that memorandum for a discussion of operational impacts that could affect utility capacity, disrupt service, and/or impair access and maintenance functions.

5.2.3 Elevated Structure Alternative

The Elevated Structure Alternative includes a combination of retrofitting and rebuilding the viaduct and rebuilding the seawall. Revisions in the alignment of the various structures to this alternative have been made; however, the revisions do not affect the typical operational impacts discussed in Sections 5.2.2 and 5.2.4 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum. Those sections describe the operational impacts that could affect utility capacity, disrupt service, and/or impair access and maintenance functions.

5.2.4 Benefits

Similar to the analysis of utilities contained in Section 5.2.3 of the 2004 Draft EIS Appendix O, the potential exists for utility infrastructure upgrades at selected locations. The details of the potential utility system upgrades would be specified later as part of preliminary and final design in consultation with the utility purveyors. In effect, utility system upgrades that enhance system reliability and capacity could achieve a long-term operational benefit. Furthermore, implementation of either of the Supplemental Draft EIS Build Alternatives would eliminate the risk associated with a sudden unplanned loss of facilities (without major collapse) or the catastrophic failure of the existing system under the No Build Alternative, which would lead to moderate to severe utility impacts.

5.3 Construction Impacts to Utilities

5.3.1 Overview

The Draft EIS covered a range of construction impacts on utilities, both for the utility relocations and for potential impacts on the provision of utilities. The impacts are considered for electric power, water facilities, sanitary sewer, storm drainage, gas/steam/oil, and telecommunications, based primarily on the linear feet of utilities affected by the proposed alternatives. Collectively, the linear utility relocation estimates presented in Section 5.3.4 of the 2004 Draft EIS

Appendix O, Public Services and Utilities Technical Memorandum, are still valid. However, elements of the Tunnel and Elevated Structure Alternatives have changed since the March 2004 submittal of the Draft EIS. Consequently, variations for these two alternatives and their potential impacts are included in the following sections.

Approach

As noted above, the Draft EIS prepared in March 2004 analyzed the impacts of the Build Alternatives based primarily on conceptual estimates for temporary and permanent utility relocations in terms of linear feet. Other factors were included, such as the direct construction effects associated with temporary and permanent utility relocations. These effects included pavement demolition, excavation, backfill, repaving, ground support systems, dust and noise monitoring, relocation impacts to other localized utilities, traffic disruptions, and the increased risk of schedule delays, temporary service outages, and construction accidents.

The potential impact from utility relocations and the direct effects of construction were predicted to occur throughout the entire AWV Corridor. The existing utilities and the concepts for temporary and permanent utility relocations are based on key locations in the AWV Corridor, which were chosen to be representative of the conceptual design for the Supplemental Draft EIS alternatives. These representative locations were identified in the June 30, 2005 conceptual utility plans and the November 16, 2005 Concept 12C conceptual utility plans.

Additionally, concepts for utility relocations identified in the June 2005 design plan drawings for the Tunnel and Elevated Structure Alternatives include Phase 1, 2, and final scenarios. The phasing scenarios provide a possible sequencing required for the temporary and permanent utility relocations at key locations in the AWV Corridor. For the Tunnel Alternative, the phasing scenario varies by the configuration (e.g., stacked versus side-by-side tunnel alignments). For the stacked tunnel alignment, Phase 1 relates to temporarily relocating or protecting in-place the utilities to accommodate the rebuilt seawall and finally completing the surface street improvements and permanent utility relocations.

For the side-by-side tunnel alignment, Phase 1 relates to temporarily relocating or protecting in-place utilities to build the west side of the tunnel, followed by temporarily relocating or protecting in-place utilities to build the east side of the tunnel under Phase 2, and finally completing the surface street improvements and the permanent utility relocations.

It should be noted that for either of the Build Alternatives, utility placement on overhead poles may still need to be considered for temporary relocation of the

transmission lines (landside or waterside) (Kirchner 2006 personal communication).

For the Elevated Structure Alternative, Phase 1 relates to protecting in-place utilities or relocating utilities for construction of the seawall and structural improvements. The final phase relates to surface restoration.

Utility Design Assumptions

The utility design assumptions have changed somewhat from those described in the Draft EIS. Both alternatives would require portions of the extensive network of utilities to be temporarily relocated for construction and moved again to their final locations, while other portions would be moved only once. However, their future locations might change from the final locations described in the Draft EIS. Below is a summary of the current general utility design assumptions for the project:

- Relocating utilities to temporary or permanent locations prior to construction is anticipated to take approximately 30 months. The relocations performed in this window of time only represent the initial utility relocations, with other relocations to follow.
- Utilities would be relocated the minimum number of times required through ongoing planning and coordination with the utilities agencies. The preferred first move of the utilities would generally be to the permanent location, though some utilities would require an additional temporary relocation. Generally, it is anticipated that the major utilities would not need to be moved more than two times. However, a number of planning scenarios could require up to three moves of both distribution and transmission lines.
- The intent of utility relocations is to keep as many utilities in the AWV Corridor as possible. To that end, every effort would be made to minimize service disruptions and capacity issues by implementing a comprehensive utility relocation plan to address short-term and long-term relocations.
- Four major electrical transmission lines would need to be relocated, and each would require a separate shutdown period. These shutdowns must be requested (through an application process) 1 year in advance, and no more than two shutdowns can be applied for in any given year. The approvals for each shutdown period could take up to 1 year to obtain.

- Regarding Seattle City Light (SCL) relocations, the SCL Disaster Plan is only intended for short-term relocations, which are typically carried out as part of a contingency. Planned outages are scheduled so that crews can work safely to maintain or rebuild the electrical system. In these cases, every effort would be made to give affected customers the courtesy of advance notice, in person or in writing.
- SCL maintains a policy of evaluating measures to reduce electric and magnetic fields (EMFs) in the design of new facilities and would do so in determining the best solutions for power line relocation for the project. SCL is the responsible agency for installation of the power lines.
- Utility relocation would require close coordination among all utilities (both public agencies and private providers) involved to minimize the frequency and degree of disruption, to maintain services and provide for future services, to design to current standards, to develop specific standards, and to maintain access for utility workers. Coordination efforts among agencies are being discussed and would continue throughout the project.
- Locations for the temporary and permanent utility relocations vary between the alternatives, but most utilities are expected to remain in the existing AWV Corridor once construction is completed. Due to space constraints, some utilities might have to be relocated out of the AWV Corridor and constructed temporarily on overhead structures.
- The depth of cover over the tunnel has not yet been established, and this might affect which utilities can be relocated within the corridor.
- It should be noted that utility pole placement on overhead poles may still need to be considered for temporary relocation of the transmission lines (landside or waterside) (Kirchner 2006 personal communication).
- Longitudinal utility placement will be minimized but must be considered throughout the design process.
- No more than one transmission line will be out of service at the same time (due to the City's contingency planning).

Conceptual Utility Exhibits

Generally, the concepts for utility relocations identified in this section are based on planning-level estimates. These estimates would continue to be defined in close consultation with the utility purveyors as part of preliminary and final design in support of the Final EIS.

The conceptual utility drawings and exhibits are used in the following section only to present possible phasing and types of facilities for evaluating a range of impacts. Detailed design for both the final and interim operating conditions and coordination with the affected utilities continues.

Furthermore, the sequencing or phasing identified in the conceptual utility exhibits is for environmental analysis purposes and presents one possible way of phasing construction. It is subject to change as design and construction planning continues.

Exhibit 5-1 illustrates where these conceptual utility relocations would likely take place in the AWV Corridor.

5.3.2 Tunnel Alternative – Stacked Tunnel Alignment (Preferred Alignment)

This section addresses the stacked tunnel alignment, which is the preferred alignment. The section is organized first by identifying the key locations for the conceptual utility relocations in the AWV Corridor; second by the construction plans (shorter plan and intermediate plan), traffic stages, and construction duration; and finally by the direct effects to utilities.

Generally, the concepts for utility relocations identified in this section are based on planning-level estimates. These estimates would continue to be defined in close consultation with the utility providers as part of preliminary and final design in support of the Final EIS.

As it relates to utilities, the stacked tunnel alignment is applicable primarily to the central section of the AWV Corridor. However, for an overall comparison, the stacked tunnel alignment and the phased and final conceptual utility relocations are described for the entire AWV Corridor by section. In the central section, the viaduct would be replaced with a stacked (double-level) tunnel with three lanes in each direction from approximately S. Dearborn Street to Pine Street. From Pine Street to Virginia Street, SR 99 would transition from the tunnel to an aerial structure crossing over the BNSF rail tracks.

Regarding utilities and the Tunnel Alternative, it should be noted that there is potential for additional impacts based on the depth of the tunnel cover and the longitudinal placement of utilities. A shallow tunnel depth can create the need for additional right-of-way for utilities. This issue will continue to be defined as part of preliminary and final design in close consultation with the utility providers.

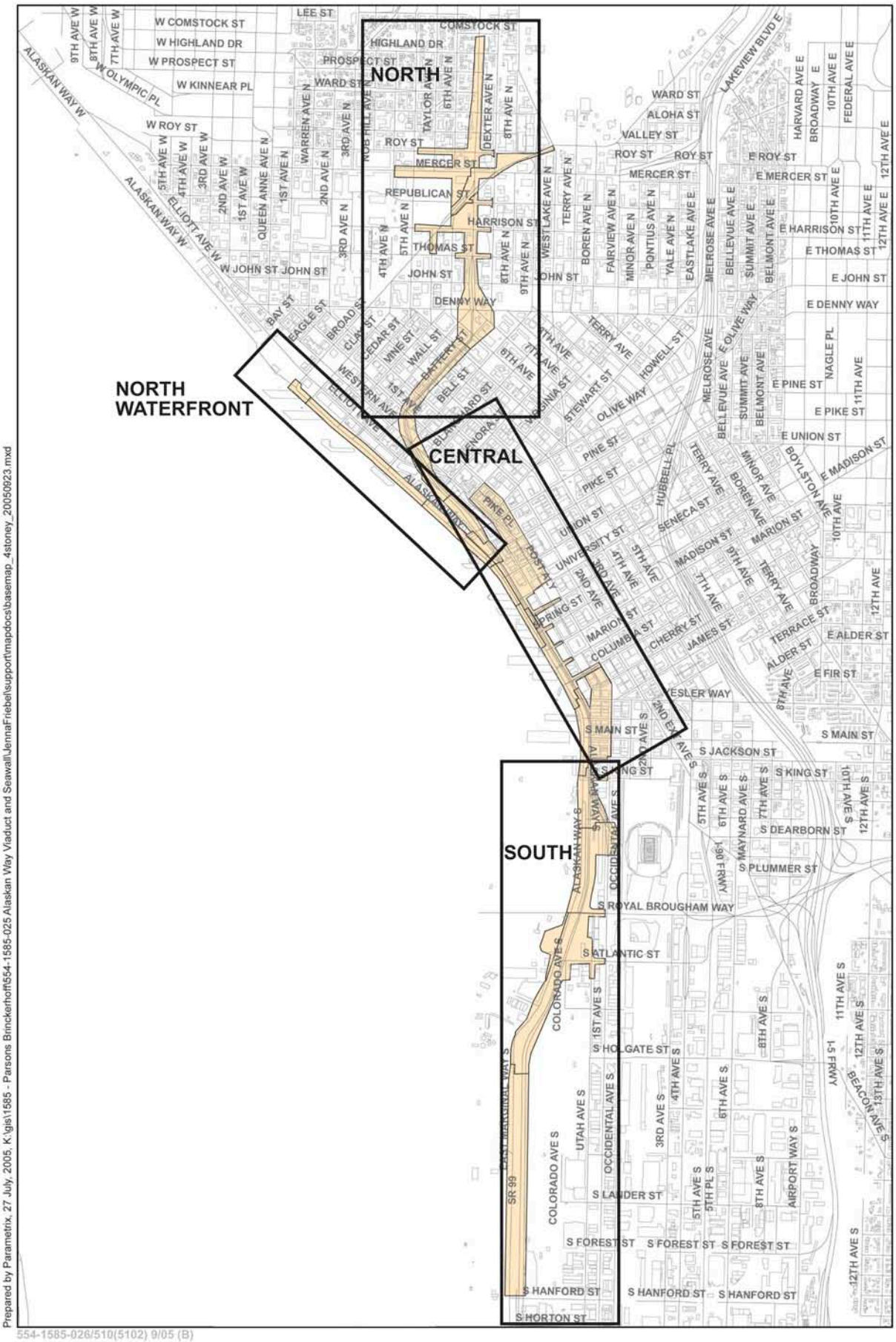

Exhibit 5-1
Outline of Conceptual Utility Relocations in the AWV Study Area

South – S. Spokane Street to S. Dearborn Street

For the stacked tunnel alignment, one location is identified in conceptual designs for proposed Phase 1 and final utility relocations. Exhibit 5-2 describes the utility relocations and sequence at key locations in the south section of the AWV Corridor.

It should be noted that for each of the conceptual utility relocation tables that follow, the design and construction planning is continuing, and the construction phasing discussed here is subject to change.

Exhibit 5-2. Phased and Final Conceptual Utility Relocations for Stacked Tunnel Alignment – South Section

Phase I	Phase 2	Final
S. Royal Brougham Way Utility Relocation Sequence		
Temporary relocation of two transmission lines		
Temporary relocation of five distribution lines		
		Relocate fiber optic/communications overhead (OH) and electrical distribution (OH) to duct banks.
		Relocate existing underground distribution line at S. Atlantic Street because of new ramp construction.
		Relocate five distribution lines.
		Relocate two electrical transmission lines (OH) to underground (UG).
		Relocate two water lines.
		Construct new combined sewer.
		Remove existing viaduct.
		Construct surface street drainage.

Note: The design and construction planning is continuing, and the construction phasing is subject to change.

Central – S. Dearborn Street to Battery Street Tunnel

In this section, there are seven locations identified in conceptual designs for proposed Phase 1 and final utility relocations. Exhibit 5-3 describes the utility relocations and sequence at key locations in the central section of the AWV Corridor.

Exhibit 5-3. Phased and Final Conceptual Utility Relocations for Stacked Tunnel Alignment – Central Section[1]

Phase I	Phase 2	Final
S. King Street Utility Relocation Sequence		
Relocate combined sewer regulator and existing combined sewer and sanitary sewer connections.	Not Applicable.	Construct tunnel.
Construct new manhole and connect existing combined sewer.		Relocate electrical distribution to duct bank.
Relocate fiber optic and communications to duct bank.	Not Applicable.	Construct surface street drainage.
Relocate major electrical transmission lines (OH) to temporary location. Relocate water line.		Relocate major electrical transmission lines to permanent location.
Relocate electrical distribution line (OH) and (UG) to temporary electrical distribution line.		
Construct new combined sewer.		
Remove existing viaduct and footings.		
S. Washington Street Utility Relocation Sequence[3]		
Relocate telephone to temporary fiber optic/communications.	Not Applicable.	Construct surface street drainage.
Relocate temporary fiber optics/ communications, fiber optic/ communications (OH), and fiber optics (UG) to fiber optics/communications duct bank.		
Relocate electrical distribution line (UG) to temporary electrical distribution location.		Relocate water, electrical transmission (OH), and high-pressure (HP) gas lines.
Temporarily support storm drain outfall and upstream pipes.		Relocate electrical distribution to duct banks.
Remove seawall.		
Construct new combined sewer.		Construct tunnel.
Construct new combined sewer with manhole, connect to existing combined sewer outfall.		Remove existing viaduct and footings.

Exhibit 5-3. Phased and Final Conceptual Utility Relocations for Stacked Tunnel Alignment – Central Section (continued)

Phase I	Phase 2	Final
Madison Street Utility Relocation Sequence[3]		
Relocate fiber optics/communications to new duct bank.	Not Applicable.	Construct tunnel.
Relocate (OH) electrical line.		Construct combined sewer outfall.
Construct new combined sewer.		Construct interim best management practice (BMP).
Construct relocated diversion structure.		Relocate electrical distribution to duct banks.
Relocate electrical distribution to temporary duct bank.		Construct surface street drainage.
		Remove existing viaduct.
University Street Utility Relocation Sequence		
Relocate fiber optics/communications to new duct bank.	Not Applicable.	Construct tunnel with combined sewer outfall pipe.
Relocate electrical distribution to temporary electrical distribution.		Relocate diversion structure.
Construct new combined sewer.		Relocate electrical distribution to duct banks.
Relocate tide valve vault.		Construct surface street drainage and interim BMP.
Connect existing diversion structure.		Construct intermediate-pressure (IP) gas line over tunnel.
Temporarily relocate gas line.		Remove existing viaduct and footings.
Pike Street Utility Relocation Sequence		
Relocate steam line.		
Relocate telephone and fiber optic to fiber optic/communications duct bank.	Rebuild seawall.	
Relocate electrical distribution duct bank.[1]	Relocate electrical transmission lines (UG).	Construct surface street drainage.
Relocate HP gas line.	Remove existing viaduct and footings.	
Construct new combined sewer.	Construct southbound side of tunnel.	Construct northbound side of tunnel.
	Adjust utilities to finished grade.[2]	

Exhibit 5-3. Phased and Final Conceptual Utility Relocations for Stacked Tunnel Alignment – Central Section (continued)

Phase I	Phase 2	Final
Elliott Avenue Utility Relocation Sequence		
Relocate fiber optic to Western Avenue duct bank.	Not Applicable.	Relocate water and fiber optics into bridge structure.
Relocate electrical transmission lines to Western Avenue.		Construct surface street drainage.
Remove existing viaduct, ramps, and footings.		
Temporarily relocate water line and electrical distribution.		
Construct retaining walls, roadway, and ramp.		
Combined sewer relocation design requires coordination with City of Seattle.	Not Applicable.	
Western Avenue Utility Relocation Sequence		
Relocate fiber optic to duct bank.	Not Applicable.	Relocate water and gas lines into bridge structure.
Relocate electrical transmission lines to temporary location.		Construct surface street drainage.
Temporarily relocate gas and water.		Relocate electrical transmission lines to permanent location.
Combined sewer relocation design requires coordination with City of Seattle.		
Remove existing viaduct and footings.		
Construct proposed SR 99.		

Note: The design and construction planning is continuing, and the construction phasing is subject to change.
[1] Preliminary engineering would make the determination of the temporary and permanent routes.
[2] This sequence occurs when the surface street has been restored late in the project.
[3] Construction of sequence at final stage of relocations might not match needs for Phase 1 relocation north of S. Dearborn Street. SCL labor resource constraints might cause conflict with Phase 1 schedule.

North Waterfront – Pine Street to Broad Street

For the north waterfront section, a large electrical transmission line could be relocated to the AWV Corridor and adjacent streets. However, temporary space constraints imposed during the rebuilding of the seawall may prevent placement of a new transmission line along the proposed route. Furthermore, one or both existing network distribution systems in this area of the project could be relocated twice, once for temporary relocation and once to the

permanent location. These relocation issues will continue to be coordinated in close consultation with SCL, as design work advances.

The close proximity of these high-voltage lines to the occupational and residential environments at the north waterfront presents potential EMF exposure concerns. EMFs surround electric power lines, electric wiring, and equipment. Research on whether exposure to EMFs can lead to adverse impacts on human health has been underway for many years. In the urban environment, power lines might be located fairly close to residences and work places, and as a result, EMFs are considered in the planning and design of new electrical facilities.

SCL's policy of evaluating measures to reduce EMFs in the design of new facilities will determine the best solutions for power line relocation for the project. SCL also routinely provides information on EMFs, the electrical system, and available research on possible health effects as questions and concerns arise.

North – Battery Street Tunnel to Comstock Street

In this section, there are eight locations identified in conceptual designs for proposed Phase 1 and final utility relocations north of the Battery Street Tunnel. Exhibit 5-4 describes the utility relocations and sequence at these key locations in the north section of the AWV Corridor.

In addition to the above conceptual utility relocations listed in Exhibit 5-4, SCL network engineering expects major relocations of its system at the north and south Battery Street Tunnel portals should the option to widen both portals of the Battery Street Tunnel be selected as part of the Tunnel Alternative. Such activities might include moving primary services and manholes, or possibly moving feeders and secondary lines.

Exhibit 5-4. Phased and Final Conceptual Utility Relocations for Stacked Tunnel Alignment – North Section

Phase I	Phase 2	Final
North and South Portal Battery Street Tunnel Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Lower tunnel floor.
		Remove existing drainage as needed.
		Construct new combined sewer and underdrain.
		Install new storm drain (tunnel drain).

Exhibit 5-4. Phased and Final Conceptual Utility Relocations for Stacked Tunnel Alignment – North Section (continued)

Phase I	Phase 2	Final
Aurora Avenue N. at Thomas Street Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Remove existing building on west side of Aurora Avenue N.
		Construct new combined sewer from John Street to Mercer Street.
		Relocate water line.
		Relocate fiber optic/communications to fiber optic/communications duct bank.
		Relocate electrical distribution to electrical distribution duct bank in Dexter Avenue N.
		Construct new storm drain.
		Construct surface street drainage.
Aurora Avenue N. at Harrison Street Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate combined sewers.
		Relocate water line.
		Relocate fiber optic/communications to fiber optic/communications duct bank.
		Relocate electrical distribution to electrical distribution duct bank.
		Construct surface street drainage.
Aurora Avenue N. at Mercer Street Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Protect Mercer Street Tunnel.
		Relocate existing combined sewer to combined sewer on south side of Mercer Street.
		Relocate water line.
		Relocate fiber optic/communications to duct bank.
		Construct electrical distribution duct bank.
		Construct surface street drainage.
Thomas Street at Aurora Avenue N. Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate electrical distribution to duct banks.
		Relocate fiber optic/communications to duct bank.
		Relocate electrical transmission lines.
		Relocate combined sewer west of Aurora Avenue N.

Exhibit 5-4. Phased and Final Conceptual Utility Relocations for Stacked Tunnel Alignment – North Section (continued)

Phase I	Phase 2	Final
Harrison Street at Aurora Avenue N. Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate gas line.
		Relocate combined sewer to run along east and west side of Aurora Avenue N.
		Relocate electrical distribution to duct banks.
		Construct surface street drainage.
Mercer Street at Aurora Avenue N. Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Protect Mercer Street Tunnel.
		Protect existing storm drain.
		Relocate HP gas line.
		Intercept combined sewer with new combined sewer south of Mercer Street.
		Relocate water line.
Sixth Avenue N. South of Mercer Street Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate electrical distribution to duct bank.
		Relocate combined sewer.
		Relocate water line.
		Relocate fiber optic/communications to duct bank.

Note: The design and construction planning is continuing, and the construction phasing is subject to change.

Seawall – S. Washington Street to Broad Street

With the exception of the utility relocations described in Exhibit 5-5 below, utility relocations for this section of the AWV project area are addressed in the central section discussion found in Section 5.3.1. Specifically, Exhibit 5-3 outlines the relocation sequence associated with reconstruction of the seawall. Additional impacts were previously addressed within the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum.

5.3.3 Tunnel Alternative – Construction Plans

As described in Section 4.3.1, two construction plans are being considered for the Tunnel Alternative for traffic closures on SR 99 between S. Spokane Street and Denny Way. These plans differ in the nature and duration of closure. The intermediate plan would close SR 99 partially or completely as required by construction phasing. The shorter plan would have the shortest overall construction duration, but it would close SR 99 for the longest period.

Exhibit 5-5. Phased and Final Conceptual Utility Relocations for Stacked Tunnel Alignment – Seawall[1]

Phase I	Phase 2	Final
Vine Street Utility Relocation Sequence		
Relocate electrical distribution duct banks to temporary electrical distribution.	Not Applicable.	Rebuild seawall.
Relocate fiber optic/communications and coordinate with BNSF.		Construct fiber optic/ communications duct bank.
Relocate diversion structure and coordinate with BNSF.		Construct new combined sewer.
		Construct interim BMP.
		Construct surface street drainage.
		Relocate electrical distribution duct banks to permanent location.

Note: The design and construction planning is continuing, and the construction phasing is subject to change.
[1] Preliminary engineering will make the determination of the temporary and permanent routes.

Shorter Plan

The shorter plan would fully close SR 99 to north-south traffic for a minimum of 42 months (3.5 years). The majority of construction work would occur with the corridor closed, with the exception of the Traffic Stage 1 utility relocations. The duration of construction with the shorter plan would be approximately 7 years for either tunnel alignment. The net effect would be an increase in traffic congestion on north-south arterials in the downtown corridor, which could result in added difficulty to maintain access to utility services during construction.

The range of these impacts was generally identified in the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum, although with the shorter plan, the magnitude of these minor- to moderate-intensity impacts would increase proportionately based on the change in duration of the closure.

Generally, the concepts for utility relocations identified in this section are based on planning-level estimates. These concepts and estimates would continue to be defined in close consultation with the utility purveyors as part of preliminary and final design in support of the Final EIS.

Intermediate Plan

Under the intermediate plan, the stacked tunnel alignment would close SR 99 for 27 months, and the side-by-side tunnel alignment would close SR 99 for 18 months. In Traffic Stage 1, parking under the viaduct would be removed and surface traffic on Alaskan Way would be reduced to one lane in each direction as required for the utility relocations and the construction of the west half of the SODO Ramps. The net effect would be an increase in traffic congestion on north-south arterials in the downtown area, which could make it more difficult to maintain access to utility services during construction.

The range of these impacts was generally identified in Chapter 6 of the 2004 Draft EIS Appendix O, although with the intermediate plan, the magnitude of these minor- to moderate-intensity impacts would increase proportionately based on the change in the duration of the closures.

5.3.4 Stacked Tunnel Alignment – Traffic Stages and Construction Duration

Construction plans for each alternative, alignment, and option would include a series of traffic stages, each of which would correspond to a specific phase of construction. Although traffic stages would be planned to minimize effects to traffic, they would nevertheless cause significant changes to traffic flow and routes within the corridor, such as detours or closures.

In Traffic Stage 1, parking under the viaduct would be removed and surface traffic on Alaskan Way would be reduced to one lane in each direction as required for the utility relocations and the construction of the west half of the SODO Ramps. Coupled with the full closure of the corridor for a minimum of 42 months (3.5 years) during construction with the shorter plan or 27 months with the intermediate plan, the net effect around the project area would be an increase in traffic congestion and delay on roads around the construction area. However, the overall duration of impacts would be shortened.

5.3.5 Stacked Tunnel Alignment – Direct Effects to Utilities

Similar to the utilities discussion in Section 5.3.1 and in the 2004 Draft EIS Appendix O, the direct effects of construction for temporary and permanent utility relocations could include pavement demolition, excavation, backfill, repaving, disruption of ground support systems, dust and noise monitoring, relocation impacts to other localized utilities, traffic disruptions, increased traffic delay, temporary service outages, and construction accidents. Other substantive effects include utility crew support of construction activities, potential repairs due to access restrictions, temporary bypassing, and

temporary services. If not properly mitigated, these activities could potentially generate adverse impacts.

For the stacked tunnel alignment, the risk of direct effects to electrical power, wet utilities, and telecommunications would be similar for all sections (south, central, north, north waterfront, seawall) in the AWV project area. The risk would be somewhat greater for the south, central, and north sections due to the number and complexity of utility relocations for electrical distribution and transmission lines, water and sewer facilities, and fiber optic/telephone cable and other facilities. It should also be noted that the south section would require a large number of relocations, both temporary and permanent, due to inadequate space available to relocate existing utilities.

The stacked tunnel alignment would have proportionately greater potential impacts on utilities than the Elevated Structure Alternative, and fewer impacts on utilities than the side-by-side tunnel alignment. The basis for this assessment is that the stacked tunnel alignment would have more phased and final utility relocations than the Elevated Structure Alternative and fewer than the side-by-side tunnel alignment. For potential utility relocation impacts under the stacked tunnel alignment, the central and north sections of the AWV Corridor would experience the greatest number of impacts based on the complexity and the number of temporary and final relocations.

The north waterfront section includes replacement of the existing seawall from Union Street to Broad Street, except for a section at Pier 66 between Blanchard and Battery Streets, which would require only soil improvements due to an upgrade of this section in the mid-1990s. To prepare this area for seawall construction, all of the utilities within 60 feet of the seawall would be relocated. As part of the relocation effort, space would be reserved for the transmission lines between the east edge of the seawall construction limits and the west side of the limits of relocated utilities. Once the seawall work has been completed (utilities already relocated), excavation required for the seawall construction would be backfilled.

It is during this backfilling that the casing (pipeline) for the transmission lines would be placed in Alaskan Way. After completion of the casing installation, the conductors would be installed and the cutover connections made at the vault locations. During that time, the surface restoration work for Alaskan Way would be completed. Scheduling the outages and clearances would not have an effect on the distribution system and should not have an impact on any residences or businesses. Impacts would be due to construction and utility relocation activities, but there would be no specific impacts for the installation of the large electrical transmission lines.

5.3.6 Tunnel Alternative – Side-by-Side Tunnel Alignment

This section addresses the side-by-side tunnel alignment. The section is organized first by identifying the key locations for the conceptual utility relocations in the AWV Corridor; second by the construction plans (shorter plan and intermediate plan), traffic stages, and construction duration; and finally by the direct effects to utilities. Generally, the concepts for utility relocations identified in this section are based on planning-level estimates. These estimates would continue to be defined in close consultation with the utility purveyors as part of preliminary and final design in support of the Final EIS.

As an option with the Tunnel Alternative, the viaduct would be replaced with a six-lane, side-by-side tunnel from approximately S. Dearborn Street to Pine Street in this central section of the AWV Corridor. From Pine Street to the Battery Street Tunnel, the existing aerial structure and the Elliott and Western Avenue ramps would be replaced with new structures. For an overall comparison, however, the side-by-side tunnel alignment and the phased and final conceptual utility relocations are described by section for the AWV Corridor.

South – S. Spokane Street to S. Dearborn Street

For the side-by-side tunnel alignment in the south section of the project area, there is one location identified in conceptual designs for proposed Phase 1 and final utility relocations. Exhibit 5-6 describes the utility relocations and sequence at this key location (S. Royal Brougham Way) in the south section of the AWV Corridor.

Central – S. Dearborn Street to Battery Street Tunnel

In this section, there are seven locations identified in conceptual designs for proposed Phase 1, Phase 2, and final utility relocations. Exhibit 5-7 describes the utility relocations and sequence at key locations in the central section of the AWV Corridor.

Exhibit 5-6. Phased and Final Conceptual Utility Relocations for Side-by-Side Tunnel Alignment – South Section

Phase I	Phase 2	Final
S. Royal Brougham Way Utility Relocation Sequence[1]		
Not applicable.	Not applicable.	Relocate fiber optic/communications (OH) and electrical distribution (OH) to duct banks.
		Relocate electrical transmission lines (OH) to (UG).
		Relocate water line.
		Construct new combined sewer.
		Construct surface street drainage.
		Remove existing viaduct.

Note: The design and construction planning is continuing, and the construction phasing is subject to change.

[1] The side-by-side tunnel would be built in two phases, with the southbound tunnel section built first and then the northbound tunnel section built.

Exhibit 5-7. Phased and Final Conceptual Utility Relocations for Side-by-Side Tunnel Alignment – Central Section[1, 2, 3, 4]

Phase I	Phase 2	Final
S. King Street Utility Relocation Sequence		
Relocate electrical distribution duct banks to temporary electrical distribution.	Move water line, electrical distribution duct banks, and electrical transmission lines (OH) to final location over southbound tunnel.	Construct electrical transmission lines, fiber optic/ communications duct bank, and combined sewer.
Temporarily relocate water line.	Remove existing viaduct and footings.	Construct surface street drainage.
Temporarily relocate fiber optic/ communications.	Construct northbound tunnel.	
Combined sewer relocation (to the north). Requires coordination with City of Seattle.		
Rebuild combined sewer.		
Construct southbound tunnel.		

Exhibit 5-7. Phased and Final Utility Relocations for Side-by-Side Tunnel Alignment – Central Section (continued)

Phase I	Phase 2	Final
S. Washington Street Utility Relocation Sequence		
Relocate telephone to temporary fiber optic/communications.	Relocate electrical distribution (OH), water, and gas lines over southbound tunnel.	Relocate electrical transmission lines (UG).
Relocate electrical distribution at seawall to temporary electrical distribution location.	Relocate electrical transmission lines.	Relocate remaining fiber optic/ communications.
Remove storm drain outfall and upstream pipes.	Construct northbound tunnel.	Construct interim BMP.
Construct southbound tunnel.	Construct combined sewer over northbound tunnel; coordinate with structural design.	Construct new combined sewer.
Construct new combined sewer within tunnel roof and connect to existing outfall.		Remove existing viaduct.
		Remove existing east side footings near S. Washington Street.
		Remove seawall.
		Construct surface street drainage.
Madison Street Utility Relocation Sequence		
Relocate electrical distribution (OH) and (UG) to temporary electrical distribution.	Remove seawall and construct southbound side of tunnel.	Relocate electrical distribution to duct banks.
Construct new combined sewer.	Construct electrical transmission lines above southbound tunnel.	Construct northbound side of tunnel.
Relocate telephone and fiber optic to fiber optic/ communications duct bank.		Construct interim BMP.
Relocate electrical transmission lines (OH) to (UG).		Move water and gas lines to final locations.
Temporarily relocate water and gas lines.		Remove existing viaduct.
Relocate diversion structure.		Construct surface street drainage.

Exhibit 5-7. Phased and Final Utility Relocations for Side-by-Side Tunnel Alignment – Central Section (continued)

Phase I	Phase 2	Final
University Street Utility Relocation Sequence[5]		
Relocate electrical distribution (OH) and (UG) to temporary electrical distribution.	Construct southbound tunnel.	Remove existing viaduct.
Relocate electrical transmission lines.	Relocate water, steam, electrical distribution, and gas lines.	Construct northbound tunnel.
Relocate telephone and fiber optic/communications into fiber optic/communications duct bank.	Construct new combined sewer.	Construct interim BMP.
Temporarily relocate steam.	Relocate diversion structure.	Construct surface street drainage.
Pike Street Utility Relocation Sequence[6]		
Relocate steam.	Rebuild seawall.	Construct northbound side of tunnel.
Relocate electrical transmission and electrical distribution.	Remove existing viaduct.	
Relocate telephone and fiber optic to fiber optic/communications duct bank.	Construct southbound side of tunnel.	Construct surface street drainage.
Construct new combined sewer.	Adjust utilities to finished grade.	
Elliott Avenue Utility Relocation Sequence		
Not applicable.	Not applicable.	Relocate fiber optic to Western Avenue duct bank.
		Relocate electrical distribution.
		Remove existing viaduct, ramps, and eastern footings.
		Relocate electrical transmission lines to Alaskan Way.
		Construct retaining walls, roadway, and ramp.
		Relocate combined sewer.
		Construct surface street drainage.

Exhibit 5-7. Phased and Final Utility Relocations for Side-by-Side Tunnel Alignment – Central Section (continued)

Phase I	Phase 2	Final
Western Avenue Utility Relocation Sequence		
Not applicable.	Not applicable.	Remove existing viaduct.
		Verify column locations during preliminary design.
		Relocate fiber optic/ communications to duct bank.
		Construct surface street drainage.

Note: The design and construction planning is continuing, and the construction phasing is subject to change.

[1] Preliminary engineering will make the determination of the temporary and permanent routes.

[2] Simultaneous relocations of three elements of the SCL system are scheduled. SCL labor resource constraints might cause conflict with this schedule.

[3] A different utility relocation plan or sequence would be required for this area to accommodate electric power and SCL.

[4] Combined sewer relocation design requires coordination with City of Seattle.

[5] The relocation at University Street sequence shows permanent electrical relocation in Phase 2, concurrent with the installation of the southbound tunnel and prior to construction of the northbound tunnel. As a result, access during construction of the two tunnels makes this scenario improbable.

[6] Pike Street relocation shows only one relocation of the distribution system. This can only occur if the civil design for the transition section/retained cut and ramps to Battery Street Tunnel in this vicinity are complete in time for the design of electrical relocations. Otherwise, an additional relocation of distribution would be required.

North Waterfront – Pine Street to Broad Street

For this section, a large electrical transmission line could potentially be relocated along Alaskan Way from Pine Street to about Vine Street, where it would run east to tie into the existing vault at Western Avenue. The line comes north out of the Massachusetts Substation, connects at the Union Substation, and continues north and then east to the Broad Street Substation. It should be noted that these relocations are still being planned and designed, and coordination between the Project and the agencies is ongoing.

North – Battery Street Tunnel to Comstock Street

The utility relocation impacts generated by the side-by-side tunnel alignment would be similar to those described above for the stacked tunnel alignment.

Seawall – S. Washington Street to Broad Street

With the exception of the utility relocations described in Exhibit 5-8 below, utility relocations for this section of the AWV project area are covered in Section 5.3.1. Additionally, Exhibit 5-7 outlines the relocation sequence associated with reconstruction of the seawall. Additional impacts were previously addressed within Section 5.4 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum.

Exhibit 5-8. Phased and Final Conceptual Utility Relocations for Side-by-Side Tunnel Alignment – Seawall

Phase I	Phase 2	Final
Vine Street Utility Relocation Sequence		
Relocate electrical distribution duct banks to temporary location.	Not applicable.	Rebuild seawall.
Relocate fiber optic/communications.		Construct fiber optic/communications duct bank.
Relocate diversion structure and coordinate with BNSF.		Construct electrical distribution duct banks.
		Construct new combined sewer.
		Construct interim BMP.
		Construct surface street drainage.

Note: The design and construction planning is continuing, and the construction phasing is subject to change.

5.3.7 Side-by-Side Tunnel Alignment – Traffic Stages and Construction Duration

Construction plans for each alternative, alignment, and option would include a series of traffic stages, each of which would correspond to a specific phase of construction. Although traffic stages would be planned to minimize effects to traffic, they would nevertheless cause significant changes to traffic flow and routes within the corridor, such as detours or closures.

In Traffic Stage 1, parking under the viaduct would be removed and surface traffic on Alaskan Way would be reduced to one lane in each direction as required for the utility relocations and the construction of the west half of the SODO Ramps. Coupled with the full closure of the viaduct for a minimum of 42 months (3.5 years) with the shorter construction plan, the net effect around the project area would be an increase in traffic congestion and delay on the primary roads affected by construction and on surrounding roads around the construction area.

With the intermediate construction plan, there are six stages identified for construction of the side-by-side tunnel alignment, which are estimated to last up to 8 years. For Traffic Stage 1, the Draft EIS estimated that this stage would take up to 18 months. In the Supplemental Draft EIS, the new estimate calls for Traffic Stage 1 to take up to 30 months.

Generally, the area affected would include a section from S. Royal Brougham Way to the south portal of the Battery Street Tunnel and an area from the west side of the columns of the existing viaduct to the east side of the existing AWV Corridor. The construction scenario assumes that multiple contractors

performing temporary and permanent utility relocations would occupy the affected area. Traffic Stage 1 would include a number of construction activities ranging from utility relocations, start of secant pile wall construction between Pier 48 and Colman Dock, and soil improvements west along the west side of SR 519. Additional activities would include removing public and private parking under the viaduct and reducing Alaskan Way to one lane in each direction.

5.3.8 Side-by-Side Tunnel Alignment – Direct Effects to Utilities

The impacts are considered for electric power, water facilities, sanitary sewer, storm drainage, gas/steam/oil, and telecommunications, based primarily on the linear feet of utilities affected by the proposed alternatives.

The direct effects to utilities would be similar to the description provided above for the stacked tunnel alignment in Sections 5.3.1 and 5.3.5. In comparison to the Elevated Structure Alternative and the stacked tunnel alignment, the side-by-side tunnel alignment would have proportionately greater potential impacts overall on utilities.

The basis for this assessment is that the side-by-side tunnel alignment would have more phases (Phases 1, 2, and 3) and final utility relocations than the Elevated Structure Alternative and the stacked tunnel alignment. As a result, the direct effects to utilities from construction, such as pavement demolition, excavation, backfill, repaving, disruption of ground support systems, dust and noise monitoring, relocation impacts to other localized utilities, and traffic disruptions, and the increased risk of schedule delays, temporary service outages, and construction accidents would be proportionately higher.

Within the AWV Corridor, the south, central, and north sections would experience the greatest potential impacts related to temporary and permanent utility relocations. This is based on the number and complexity of the potential utility relocations. The south section also has a greater number of relocations, both temporary and permanent, due to inadequate space available to relocate existing utilities.

5.3.9 Elevated Structure Alternative

This section addresses the Elevated Structure Alternative. The section is organized first by identifying the key locations for the conceptual utility relocations in the AWV Corridor, second by the construction plan (longer plan) and traffic stages and construction duration, and finally by the direct effects to utilities. Generally, the concepts for utility relocations identified in this section are based on planning-level estimates. These concepts and

estimates would continue to be defined in close consultation with the utility purveyors as part of preliminary and final design in support of the Final EIS.

South – S. Spokane Street to S. Dearborn Street

One location is identified in conceptual designs for proposed Phase 1 and final utility relocations. Exhibit 5-9 describes the utility relocations and sequence at this key location (S. Royal Brougham Way) in the south section of the AWV Corridor.

Exhibit 5-9. Phased and Final Conceptual Utility Relocations for Elevated Structure Alternative – South Section

Phase I	Phase 2	Final
S. Royal Brougham Way Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate fiber optic, communication (OH), and electrical distribution (OH) to duct banks.
		Relocate water line.
		Relocate electrical transmission lines (OH) to (UG).
		Construct surface street drainage.
		Remove existing viaduct.

Note: The design and construction planning is continuing, and the construction phasing is subject to change.

In addition to the sequence and relocations identified above in Exhibit 5-9, it is important to note that as part of the Elevated Structure Alternative, Phase 2 of the SR 519 project would add a new ramp at First Avenue S. and S. Atlantic Street. This action would require the relocation of existing underground distribution prior to the start of ramp construction. Furthermore, the relocation of existing underground and overhead distribution is shown as being performed concurrent with viaduct removal at S. Royal Brougham Way. If construction of SR 519 occurs at the same time as Traffic Stage 1 utility relocation of the AWV Project, utilities and distribution facilities may need to be relocated twice, and the overhead distribution lines on the viaduct may need to be removed earlier.

Central – S. Dearborn Street to Battery Street Tunnel

In this section, seven locations are identified in conceptual designs for proposed Phase 1 and final utility relocations. Exhibit 5-10 describes utility relocations and sequence at key locations in the central section of the AWV Corridor.

Exhibit 5-10. Phased and Final Conceptual Utility Relocations for Elevated Structure Alternative – Central Section

Phase I	Phase 2	Final
S. King Street Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate electrical transmission lines (OH and UG).
		Relocate water line.
		Relocate electrical distribution line (OH).
		Relocate (UG) and (OH) fiber optic and communication to duct bank.
		Construct surface street drainage.
		Remove existing viaduct.
		Construct new combined sewer conveyance.
S. Washington Street Utility Relocation Sequence		
Relocate two electrical distribution duct banks.	Not Applicable.	Relocate electrical distribution (OH) to electrical distribution duct bank.
Relocate sanitary sewer.		Relocate electrical transmission lines (OH and UG), HP gas line, and underdrain (UD).
Relocate telephone and fiber optic.		Construct surface street drainage.
Relocate water line.		Remove existing viaduct.
Construct fiber optic/ communication duct bank.		Remove approximately 16 existing footings on the west side of AWV between S. Main Street and Yesler Way and confirm if available cover and clearance.
Extend existing combined sewer.		Construct new combined sewer conveyance.
Temporarily relocate steam.		

Exhibit 5-10. Phased and Final Utility Relocations for Elevated Structure Alternative – Central Section (continued)

Phase I	Phase 2	Final
Madison Street Utility Relocation Sequence		
Relocate electrical distribution duct bank, telephone lines, and gas lines in casing for seawall construction.[1]	Not Applicable.	Construct surface street drainage.
Remove and replace diversion structure.		Relocate electrical distribution (OH) and electrical transmission lines (OH) to (UG).
		Remove existing viaduct.
		Construct new combined sewer conveyance.
University Street Utility Relocation Sequence		
Relocate telephone line for seawall construction.	Not Applicable.	Relocate storm drain, gas line, and water line.
Relocate gas line in casing for seawall construction.		Relocate temporary and OH electrical distribution to duct banks.
Temporarily relocate electrical distribution during seawall construction.		Remove existing footing near University Street and confirm if available cover and clearance during design.
		Remove existing viaduct.
Pike Street Utility Relocation Sequence		
Relocate telephone line for seawall construction.	Not Applicable.	Relocate fiber optic and communications to duct bank.
Relocate sanitary sewer for seawall construction.		Relocate electrical transmission lines.
Temporarily relocate electrical distribution during seawall construction.		Relocate electrical distribution duct bank.
Install temporary service connections.		Remove existing viaduct.
		Construct surface street drainage.
		Construct new combined sewer conveyance.

Exhibit 5-10. Phased and Final Utility Relocations for Elevated Structure Alternative – Central Section (continued)

Phase I	Phase 2	Final
Elliott Avenue Utility Relocation Sequence[2]		
Not Applicable.	Not Applicable.	Relocate fiber optic/communications to duct bank in Western Avenue.
		Relocate electrical transmission and distribution to Alaskan Way.
		Remove existing viaduct.
		Construct surface street drainage.
Western Avenue Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate fiber optic and communications to duct bank.
		Relocate electrical transmission to Alaskan way.
		Remove existing viaduct.
		Construct surface street drainage.

Note: The design and construction planning is continuing, and the construction phasing is subject to change.

[1] The gas lines would become part of new 12-inch gas line.

[2] This sequence reflects Over Elliott and Western. The plan is to remove and rebuild at this location similar to the existing structure.

In addition to the sequence and relocations identified above in Exhibit 5-10, it is important to note that the relocation of existing underground and overhead distribution is shown as being performed concurrent with viaduct removal at S. King Street. As a result, safety and operating concerns, along with leadtime issues with concurrent construction and removal, would likely require two relocations of distribution facilities and earlier removal from the viaduct.

North Waterfront – Pine Street to Broad Street

There would be no impacts in the north waterfront section because the Elevated Structure Alternative does not include any utility relocations in this area.

North – Battery Street Tunnel to Comstock Street

Nine locations are identified in conceptual designs for proposed Phase 1 and final utility relocations. Exhibit 5-11 describes the utility relocations and sequence at key locations in the north section of the AWV Corridor.

Exhibit 5-11. Phased and Final Conceptual Utility Relocations for Elevated Structure Alternative – North Section

Phase I	Phase 2	Final
South Portal Battery Street Tunnel Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Combined sewer relocation design requires coordination with City of Seattle.
		Relocate tunnel drain.
		Relocate UD (two).
North Portal Battery Street Tunnel Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate UD (two).
		Relocate tunnel drain.
		Relocate combined sewers (two).
Aurora Avenue N. at Thomas Street Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Remove existing building on west side of Aurora Avenue N.
		Construct new combined sewer from John Street to Mercer Street.
		Relocate water line.
		Relocate fiber optic/communications to fiber optic/ communications duct bank.
		Relocate electrical distribution to electrical distribution duct bank in Dexter Avenue N.
		Construct new storm drain.
		Construct surface street drainage.
Aurora Avenue N. at Harrison Street Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Combined sewer relocation design requires coordination with City of Seattle.
		Relocate water line.
		Relocate fiber optic/communications to fiber optic/ communications duct bank.
		Relocate electrical distribution to electrical distribution duct bank.
		Construct surface street drainage.

Exhibit 5-11. Phased and Final Conceptual Utility Relocations for Elevated Structure Alternative – North Section (continued)

Phase I	Phase 2	Final
Aurora Avenue N. at Mercer Street Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Protect Mercer Street Tunnel.
		Relocate existing combined sewer to combined sewer on south side of Mercer Street.
		Relocate water line.
		Relocate fiber optic/communications to duct bank.
		Construct electrical distribution duct bank.
		Construct surface street drainage.
Thomas Street at Aurora Avenue N. Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate electrical distribution to duct banks.
		Relocate fiber optic/communications to duct bank.
		Relocate electrical transmission lines.
		Relocate combined sewer west of Aurora Avenue N.—Requires coordination with City of Seattle.
Harrison Street at Aurora Avenue N. Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate gas line.
		Relocate combined sewer to run along east and west side of Aurora Avenue N. Requires coordination with the City of Seattle.
		Relocate electrical distribution to duct banks.
		Construct surface street drainage.
Mercer Street at Aurora Avenue N. Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Protect Mercer Street Tunnel.
		Protect existing storm drain.
		Relocate HP gas line.
		Intercept combined sewer with new combined sewer south of Mercer Street.
		Relocate water line.
Sixth Avenue N. South of Mercer Street Utility Relocation Sequence		
Not Applicable.	Not Applicable.	Relocate electrical distribution to duct bank.
		Combined sewer relocation design requires coordination with City of Seattle.
		Relocate water line.
		Relocate fiber optic/communications to duct bank.

Note: The design and construction planning is continuing, and the construction phasing is subject to change.

Seawall – S. Washington Street to Broad Street

With the exception of the utility relocations described in Exhibit 5-12 below, utility relocations for this section of the project area are covered in the central section of Section 5.3.1. Additionally, Exhibit 5-10 outlines the relocation sequence associated with reconstruction of the seawall. Additional impacts were previously addressed within the 2004 Draft EIS Appendix O.

Exhibit 5-12. Phased and Final Conceptual Utility Relocations for Elevated Structure Alternative – Seawall[1, 2]

Phase I	Phase 2	Final
Vine Street Utility Relocation Sequence		
Relocate electrical distribution duct banks to temporary electrical distribution.	Not Applicable.	Rebuild seawall.
Relocate fiber optic/communications for seawall construction.		Construct fiber optic/ communications duct bank.
Relocate diversion structure.		Construct interim BMP.
Relocate water line.		Construct electrical transmission lines. Conduct final relocation of distribution system out of temporary facilities (specified in Phase 1).
Relocate gas line.		Construct surface street drainage.
		Construct new combined sewer.

Note: The design and construction planning is continuing, and the construction phasing is subject to change.

[1] Preliminary engineering would make the determination of the temporary and permanent routes.

[2] A different utility relocation plan or sequence would be required for this area to accommodate electric power and SCL.

5.3.10 Elevated Structure Alternative – Construction Plan

Longer Plan

This construction plan is based on the following assumptions:

- Two lanes in each direction would be maintained at all times except for a 3-month complete closure.
- The Broad Street Detour would be used for southbound traffic in the north.
- First Avenue S. would be used for southbound traffic in the south to facilitate the earlier construction of the east half of the SODO Ramps.

- On Alaskan Way, one lane would be maintained in each direction by moving temporary detour alignments along the corridor as needed to accommodate construction activities and to provide access to waterfront businesses.
- The Battery Street Tunnel might be reopened prior to an operational ventilation system.

The duration of the total closure of SR 99 would be considerably less for the longer plan than for the Tunnel Alternative and the intermediate plan or shorter plan. As noted above, two lanes would be maintained in all directions at all times except for a 3-month complete closure. The range of these impacts was generally identified in Chapter 6 of the March 2004 Draft EIS and the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum.

5.3.11 Elevated Structure Alternative – Traffic Stages and Construction Duration

Construction plans for each alternative, alignment, and option would include a series of traffic stages, each of which would correspond to a specific phase of construction. The net effect would be an increase in traffic congestion on north-south arterials in the downtown corridor, which could result in added difficulty to maintain access to utility facilities and services during construction. The range of these impacts was generally discussed in the 2004 Draft EIS Appendix O, although with the longer plan, the magnitude of these minor to moderate impacts would increase proportionately based on the change in duration.

5.3.12 Elevated Structure Alternative – Direct Effects to Utilities

The Elevated Structure Alternative's effects on utilities would be similar to the description provided above for the stacked tunnel alignment discussed in Sections 5.3.1 and 5.3.5. In comparison to the Tunnel Alternative (looking at both the stacked and side-by-side tunnel alignments), the Elevated Structure Alternative would have proportionately fewer potential impacts on utilities.

The basis for this assessment is that the Elevated Structure Alternative would have fewer final utility relocations as identified in the conceptual plans than either the stacked or the side-by-side tunnel alignments. As a result, the direct effects to utilities from construction, such as pavement demolition, excavation, backfill, repaving, disruption of ground support systems, dust and noise monitoring, relocation impacts to other localized utilities, and traffic disruptions, and the increased risk of schedule delays, temporary service outages, and construction accidents would all be proportionately lower. Other substantive effects could include utility crew support of construction

activities, potential repairs due to access restrictions, temporary bypassing, and temporary services. If not properly mitigated, these activities could potentially generate adverse impacts.

There are fewer options under the Elevated Structure Alternative, and utility relocation impacts in the north waterfront section would not occur since no utility relocations are planned in the north waterfront section with the Elevated Structure Alternative.

5.4 Utility Mitigation

The principal construction and operational impacts identified in Chapter 5 could be mitigated as described in the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum. The notable exception relates to the consolidated utility relocation plan, a mitigation measure that was originally mentioned in the March 2004 Draft EIS, and other coordination tasks. These mitigation measures would be updated as follows:

- After selection of a Preferred Alternative, the AWV Project will prepare a consolidated utility relocation plan for both short-term and long-term relocations, consisting of key elements that include existing, temporary, and new locations for utilities, sequence and coordinated schedules for utility work, and detailed description of service disruptions. This plan will be reviewed and will need to be approved by the affected utility providers prior to the start of construction to reduce impacts.
- The project proponents will work with utility providers to ensure that the planned schedule, sequencing, and area of outage will work with the utilities. These design coordination issues will be coordinated as part of preliminary and final design.
- The AWV Project will prepare a coordinated utility communication plan to coordinate services to customers and minimize and/or avoid temporary disconnections each time a utility line is relocated. The limits on shutdowns would be documented within the plan as specified by the utility purveyor to minimize long-term impacts.

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Chapter 6 SECONDARY AND CUMULATIVE IMPACTS

Please refer to Chapter 7 of the 2004 Draft EIS Appendix O, Public Services and Utilities Technical Memorandum, for a complete discussion of the relevant secondary and cumulative impacts. For the Supplemental Draft EIS, the secondary and cumulative impacts are similar to those described in Chapter 7 of the 2004 Draft EIS Appendix O, with the following exception.

- **Belltown/Queen Anne Proposed Development** – In the Seattle Center/Queen Anne/Downtown area, there are 19 private projects currently in the process of obtaining Master Use Permits from the City of Seattle. Of those projects, seven are considered residential and/or mixed-use construction, which would provide 995 new dwelling units to the downtown area. If the projects reach their full build-out potential, by 2010, the area is estimated to contain 5.5 million square feet of new retail/office space and 1,800 new residential dwelling and mixed-use units.

The inclusion of these projects in the north section of the AWV project area might place additional demand on public services and utilities. For example, potential utility outages associated with construction would affect business and residential customers as well as public services. Additionally, a utility's ability to maintain service to a large area might be affected, depending on the sequencing and the cumulative shutdown impacts of construction activities.

To reduce these effects, a consolidated utility relocation plan will be prepared for both short-term and long-term relocations. This mitigation measure is outlined in Section 5.4.

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Chapter 7 REFERENCES

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